Teaching program

Informatique

Academic year 2020-2021

Ecole polytechnique de l'université de Nantes

November 25, 2020

Contents

Part I

Tables of teaching units

Semester 5 - unit *INFO 3*

Data, modelling, reasonning — ECTS : 8

Manager : KUNTZ-COSPEREC Pascale

Course		Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Classical Logics		7.5	10.5				18	*1.5*
• Relational data model		20	12	6			27	*3*
• Probability		12.5	7.5				12	*1.5*
• Statistical processing of information 1		13.75	10.5				28.75	*2*
▷ Consolidation in linear algebra and calculus			13.5				10	*0*
TOTAL	min	53.75	40.5	6	0	0	85.75	
	max	53.75	54	6	0	0	95.75	

Algorithms — ECTS : 7

Manager : PICAROUGNE Fabien

Course		Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Algorithms & programming		16.25	4.5	24			30	*2*
• Computational geometry		8.75	6				13	*1*
• Algorithmic competitive project with python		3.75		6			20	*1*
• Graph theory		11.25	7.5				23	*1*
▷ Consolidation in algorithms & programming				10			10	*0*
TOTAL	min	40	18	30	0	0	86	
	max	40	18	40	0	0	96	

Exploiting computer systems 1 — ECTS : 7

Manager : RICORDEL Vincent

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Concurrency in algorithms	6.25	4.5	6			11	*1.5*
• Relational Database Management Systems	13.75	12	6			17	*2*
• Introduction to computer networks	12.5	10.5	15			30.5	*3*
• Computer and operating systems 1	8.75	1.5	24			10	*2*
TOTAL	41.25	28.5	51	0	0	68.5	

Humanities and Professionnal Issues 1 — ECTS : 8

Manager : GREVIN Anouk

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Grammar and professional English 1		40					*35*
• Person : Physical education and sport 1		19.5				2	*19.5*
• Person : my relation to others		12.5				6	*13*
• Organization : understanding organizations		15				6	*13*
• Society : history of organizations and epistemology		15				3	*13*
• Methodology : decipher information skills !		16.5					*16.5*
TOTAL	0	118.5	0	0	0	17	

Sum of semester

		Lect	Tut	PW	Proj	WP	Asst	ECTS
Sum	min	135	205.5	87	0	0	257.25	30
	max	135	219	97	0	0	277.25	
Face-to-face sum		427.5 à 451						

Semester 6 - unit *INFO 3*

Exploiting computer systems 2 — ECTS : 6

Manager : LEHN Rémi

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Computer networks 2 - Protocol design		9	9			12	*1.5*
• Operating systems 2	16	1.5	18			17	*2*
• Database query processing	6.25	7	3			15	*1.5*
TOTAL	22.25	17.5	30	0	0	44	

Data and information analysis — ECTS : 6

Manager : GELGON Marc

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Fourier analysis		13.5				10	*1*
• Information theory	10	6				10	*1*
• Statistical Processing of Information 2	12.5	1.5	10.5			10	*1.5*
TOTAL	22.5	21	10.5	0	0	30	

Humanities and Professionnal Issues 2 — ECTS : 8

Manager : GREVIN Anouk

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Person : Physical education and sport 2		19.5				2	*13*
• Person : interpersonal skills		7.5				7.5	*13*
• Organization : Business Simulation 1		28					*13*
• Society : Socio-economic debating		12				12	*13*
• Methodology : Project management 1		8				5	*13*
• Grammar, Toeic and professional English 2		39	2				*35*
TOTAL	0	114	2	0	0	26.5	

Software Engineering 2 — ECTS : 10

Manager : PICAROUGNE Fabien

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Information systems design and modelling	11.25	7.5	3			8	*1.5*
• Object-oriented design and programming with C++	15	2	15			12	*2*
• Human-computer interaction	5	7.5				8	*1.5*
• C language	10	1.5	13.5			12	*2*
• Modelling-Web-HCI project		12				30	*2*
• Object-oriented C++ software project	3					30	*2*
• Web Technologies	18.75	1.5	12			8	*1.5*
TOTAL	63	32	43.5	0	0	108	

Sum of semester

	Lect	Tut	PW	Proj	WP	Asst	ECTS
Sum	107.75	184.5	86	0	0	208.5	30
Face-to-face sum	378.25						

Semester 7 - unit *ID 4*

Common courses - AI and combinatorial algorithmics ECTS : 5

Manager : RASCHIA Guillaume

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Cryptography	8.75	6				13.25	*1.5*
• Knowledge-based systems project			9			18	*1.5*
• Problem modelling and combinatorial optimization	11.25	1.5				8	*1.5*
• Logic programming	3.75	3	7.5			13.5	*1.5*
• Introduction to artificial intelligence	10	6				16	*2*
TOTAL	33.75	16.5	16.5	0	0	68.75	

Common courses - Advanced software engineering ECTS : 5

Manager : COHEN Julien

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Advanced software project in Java			1.5			30	*1.5*
• Tools for Software Development	2.5		8			0.5	*1*
• Software design patterns	10	7.5	13.5			20	*2*
• Advanced object-orientated programming in Java	7.5	9	12			20	*2*
TOTAL	20	16.5	35	0	0	70.5	

Projects 1 ECTS : 6

Manager : GUEDON Jean-Pierre

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Project management 1	4	4.5					*0*
• Long-term industrial project 1	2.5			50		110	*7*
TOTAL	6.5	4.5	0	50	0	110	

Optional - Data analysis and processing ECTS : 6

Manager : GELGON Marc

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Exploratory data analysis	11.25	4.5	9			16	*2*
• Parallel architectures and data parallelism	2.5	4.5				2	*1*
• Multimedia	12.5	1.5	9			16	*1*
• Data visualization	12.5	1.5	7.5			15	*1*
TOTAL	38.75	12	25.5	0	0	49	

Humanities-S7 ECTS : 8

Manager : GREVIN Anouk

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Professional English 3		19	2				*26.25*
• Continuous Assessment (bis)							*8.75*
• French as a Foreign Language for engineering students		18					*8.75*
• Second foreign language - German		18					*8.75*
• Second foreign language - Chinese		18					*8.75*
• Second foreign language - Spanish		18					*8.75*
• Second foreign language - Japanese		18					*8.75*
• Training for Toeic		18					*8.75*
• Sport 3		19.5				2	*15*
• Project management		10.5				10.5	*10*
• Marketing and Business Intelligence	3	10.5				10.5	*10*
• Safety Health at Work		10.5				5	*10*
• Business Simulation 1				24		2	*20*
TOTAL	3	178	2	24	0	30	

Sum of semester

	Lect	Tut	PW	Proj	WP	Asst	ECTS
Sum	102	227.5	79	74	0	328.25	30
Face-to-face sum	482.5						

Semester 7 - unit *SILR 4*

Common courses - AI and combinatorial algorithmics ECTS : 5

Manager : RASCHIA Guillaume

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Cryptography	8.75	6				13.25	*1.5*
• Knowledge-based systems project			9			18	*1.5*
• Problem modelling and combinatorial optimization	11.25	1.5				8	*1.5*
• Logic programming	3.75	3	7.5			13.5	*1.5*
• Introduction to artificial intelligence	10	6				16	*2*
TOTAL	33.75	16.5	16.5	0	0	68.75	

Optional - Images and Networks ECTS : 6

Manager : PARREIN Benoit

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Computer networks 3	10	1.5	12			17.5	*2*
• Image processing	20	1.5	10.5			23	*3*
• Signal processing	8.75	9	9			22.25	*3*
TOTAL	38.75	12	31.5	0	0	62.75	

Common courses - Advanced software engineering ECTS : 5

Manager : COHEN Julien

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Advanced software project in Java			1.5			30	*1.5*
• Tools for Software Development	2.5		8			0.5	*1*
• Software design patterns	10	7.5	13.5			20	*2*
• Advanced object-orientated programming in Java	7.5	9	12			20	*2*
TOTAL	20	16.5	35	0	0	70.5	

Projects 1 ECTS : 6

Manager : GUEDON Jean-Pierre

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Project management 1	4	4.5					*0*
• Long-term industrial project 1	2.5			50		110	*7*
TOTAL	6.5	4.5	0	50	0	110	

Humanities-S7 ECTS : 8

Manager : GREVIN Anouk

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Professional English 3		19	2				*26.25*
• Continuous Assessment (bis)							*8.75*
• French as a Foreign Language for engineering students		18					*8.75*
• Second foreign language - German		18					*8.75*
• Second foreign language - Chinese		18					*8.75*
• Second foreign language - Spanish		18					*8.75*
• Second foreign language - Japanese		18					*8.75*
• Training for Toeic		18					*8.75*
• Sport 3		19.5				2	*15*
• Project management		10.5				10.5	*10*
• Marketing and Business Intelligence	3	10.5				10.5	*10*
• Safety Health at Work		10.5				5	*10*
• Business Simulation 1				24		2	*20*
TOTAL	3	178	2	24	0	30	

Sum of semester

	Lect	Tut	PW	Proj	WP	Asst	ECTS
Sum	102	227.5	85	74	0	342	30
Face-to-face sum	488.5						

Semester 8 - unit *ID 4*

Managing company data — ECTS : 5

Manager : GUILLET Fabrice

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Design of databases and data warehouses	10	3	12			14.5	*1.5*
• Management des connaissances d'entreprise	5	10.5				6	*1*
• Financial Mathematics		10.5				2	*1*
• Hyblab project : data, web and interdisciplinarity				23		27	*2.5*
• Ethical, social and environmental issues in computer science	9						*1.5*
TOTAL	24	24	12	23	0	49.5	

Humanities and Professionnal Issues 4 — ECTS : 7

Manager : GREVIN Anouk

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Communicating on the workplace / Intercultural communication	3	10.5				5	*15*
• Quality approach and problem solving		10.5				10.5	*10*
• Sport 4		19.5				2	*15*
• Opening courses 2	10.5					10.5	*10*
• Professional Project 2 : professional project presentation				13.5		2.5	*15*
• Intercultural explorations		18					*17.5*
• French as a Foreign Language for engineering students		18					*17.5*
• Second foreign language - German		18					*17.5*
• Second foreign language - Chinese		18					*17.5*
• Second foreign language - Spanish		18					*17.5*
• Second foreign language - Japanese		18					*17.5*
TOTAL	13.5	148.5	0	13.5	0	30.5	

Long-term industrial project — ECTS : 7

Manager : GUEDON Jean-Pierre

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Discovering scientific research	2.5	3.5				1	*1*
• Long-term industrial project	7.5			86		100	*7*
• Software testing, integration and delivery	3	1.5	3				*1*
TOTAL	13	5	3	86	0	101	

Machine learning and knowledge management ECTS : 6

Manager : LERAY Philippe

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Knowledge discovery in data	15	4.5	6			12.5	*2.5*
• Computer-based knowledge engineering	15	9	12			14.5	*2.5*
• Logical inference	6.25	9				16	*2*
• Introduction to calculability and complexity theories	5	6				14	*1.5*
• Advanced neural networks	8.75	4.5	3				*2*
• Probabilistic reasoning systems	10	7.5				15	*2*
TOTAL	60	40.5	21	0	0	72	

Internship (4th year) ECTS : 5

Manager : NACHOUKI Marie-Pierre

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Internship (4th year)					400		*1*
TOTAL	0	0	0	0	400	0	

Sum of semester

	Lect	Tut	PW	Proj	WP	Asst	ECTS
Sum	110.5	218	36	122.5	400	253	30
Face-to-face sum	487						

Semester 8 - unit *SILR 4*

Advanced software and distributed computing ECTS : 7

Manager : COHEN Julien

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Parallel Computing	8.75	1.5	9			16	*1*
• Introduction to calculability and complexity theories	5	6				14	*1*
• Languages and translators	7.5	4.5	12			7.5	*1.5*
• Functional programming	5	6	7.5			3	*1*
• Computer networks and security	11.25	3		9		23	*2*
• Transaction processing	11.25	4	3			19	*1.5*
TOTAL	48.75	25	31.5	9	0	82.5	

Humanities and Professionnal Issues 4 ECTS : 7

Manager : GREVIN Anouk

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Communicating on the workplace / Intercultural communication	3	10.5				5	*15*
• Quality approach and problem solving		10.5				10.5	*10*
• Sport 4		19.5				2	*15*
• Opening courses 2	10.5					10.5	*10*
• Professional Project 2 : professional project presentation				13.5		2.5	*15*
• Intercultural explorations		18					*17.5*
• French as a Foreign Language for engineering students		18					*17.5*
• Second foreign language - German		18					*17.5*
• Second foreign language - Chinese		18					*17.5*
• Second foreign language - Spanish		18					*17.5*
• Second foreign language - Japanese		18					*17.5*
TOTAL	13.5	148.5	0	13.5	0	30.5	

Long-term industrial project ECTS : 7

Manager : GUEDON Jean-Pierre

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Discovering scientific research	2.5	3.5				1	*1*
• Long-term industrial project	7.5			86		100	*7*
• Software testing, integration and delivery	3	1.5	3				*1*
TOTAL	13	5	3	86	0	101	

Artificial intelligence and interaction — ECTS : 4

Manager : GELGON Marc

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Data analysis SILR	8.75	9	3			9.5	*1*
• Multimedia machine learning and coding	16.25	1.5	13.5	9		20	*2*
• iCreate : Interdisciplinarity, CREAtion, TEchnology				23		27	*2*
TOTAL	25	10.5	16.5	32	0	56.5	

Internship (4th year) — ECTS : 5

Manager : NACHOUKI Marie-Pierre

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Internship (4th year)					400		*1*
TOTAL	0	0	0	0	400	0	

Sum of semester

	Lect	Tut	PW	Proj	WP	Asst	ECTS
Sum	100.25	189	51	140.5	400	270.5	30
Face-to-face sum	480.75						

Semester 9 - unit *INFO5*

Humanities and Professionnal Issues 5 — ECTS : 4

Manager : GREVIN Anouk

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Training for TOEIC - s9							*0*
• Work analysis		12				4	*22.5*
• Managing people		10.5				10.5	*17.5*
• Negotiation		6	4.5			10.5	*17.5*
• Professional project 3 : skills passport				12		3	*15*
• Business Simulation 2	20.5					10	*22.5*
• Sociology of innovation	4.5					4.5	*5*
TOTAL	25	28.5	4.5	12	0	42.5	

Users and interactions — ECTS : 5

Manager : PIGEAU Antoine

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• conversational agents	5	1.5	4.5			6	*1*
• Personal data	10	1.5	6			12	*1*
• New interactions	5	1.5	6			6	*1*
• Information visualization	10	1.5				6	*1*
TOTAL	30	6	16.5	0	0	30	

Training Periods and Term Projects 3 — ECTS : 9

Manager : MARTINEZ José

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Research and Development Project				150		30	*10*
TOTAL	0	0	0	150	0	30	

Prédiction et décision — ECTS : 5

Manager : BLANCHARD Julien

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Multicriteria Decision Analysis	8.75	6				10	*3*
• Predictive analysis	7.5	3	7.5			6	*2.5*
• Data mining project	2.5		4.5			10	*1*
• Game Theory	8.75	1.5				4	*2*
TOTAL	27.5	10.5	12	0	0	30	

Company-related work — ECTS : 4

Manager : GELGON Marc

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Expressing work and competences from company-related work				10	300		*1*
TOTAL	0	0	0	10	300	0	

R&D project for students in company — ECTS : 6

Manager : MARTINEZ José

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• R&D project for students working in a company				120			*1*
TOTAL	0	0	0	120	0	0	

Humanities - Students part-time work in a company — ECTS : 5

Manager : GREVIN Anouk

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Training for TOEIC - s9							*0*
• Work analysis		12				4	*35*
• Managing people		10.5				10.5	*30*
• Negotiation		6	4.5			10.5	*30*
• Sociology of innovation	4.5					4.5	*5*
TOTAL	4.5	28.5	4.5	0	0	29.5	

Computer Networks — ECTS : 5

Manager : PARREIN Benoit

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Architecture, supervision and network management	9	1				8	*1*
• Internet multimedia	2.5	1	8.5			6	*1*
• Core and Access Networks	5	1	12			6	*1*
• Internet of Things	3	1	6			6	*1*
TOTAL	19.5	4	26.5	0	0	26	

Computer security — ECTS : 5

Manager : LEHN Rémi

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Security of Systems and Networks	7.5	1.5	11			6	*1*
• Security policies	15	1				6	*1.5*
• Confidentiality enhancement	5					6	*1*
• Database security	2.5	1	5.5			6	*1*
TOTAL	30	3.5	16.5	0	0	24	

document analysis ECTS : 5

Manager : PICAROUGNE Fabien

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Digital trace analysis	3.75	1.5	3			5	*1*
• Electronic Document Management and digitization	7.5	1.5	9			10	*1*
• Textual information retrieval	8.5	6.25	9			10	*1*
TOTAL	19.75	9.25	21	0	0	25	

architecture and administration of advanced information systems ECTS : 5

Manager : PIGEAU Antoine

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• System and cloud administration	3		12			13	*1*
• Web services and interoperability	10	1	3			6	*1*
• Distributed and Cooperative Systems	10	1.5				6	*1*
• Virtualization	2.5	1	6			4	*1*
TOTAL	25.5	3.5	21	0	0	29	

Advanced databases ECTS : 5

Manager : RASCHIA Guillaume

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Structured documents and NoSQL	8.75	1.5	9			8	*1*
• Logs and temporal data	2.5	0.5	3			3	*1*
• Data quality	6.25	2.75	3			8	*1*
• Spatial and temporal databases	7.5	1	6			6	*1*
TOTAL	25	5.75	21	0	0	25	

Unstructures data and semantics ECTS : 5

Manager : GUILLET Fabrice

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Natural language processing	10	1.5	8.5			8	*1*
• Semantic web	6	6.5	7.5			9	*1*
• Web semantic application and experiences	1.25	3	9			11	*1*
TOTAL	17.25	11	25	0	0	28	

Sum of semester

	Lect	Tut	PW	Proj	WP	Asst	ECTS
Sum	224	110.5	168.5	292	300	319	68
Face-to-face sum	795						

Semester 10 - unit *INFO 5 - S10 - CONTRAT PRO*

Contrat pro - S10 ECTS : 28

Manager : NORMAND Nicolas

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Contrat pro - S10							*1*
TOTAL	0	0	0	0	0	0	

Retex contrat pro ECTS : 2

Manager : NORMAND Nicolas

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Experience feedback	24						*1*
TOTAL	24	0	0	0	0	0	

Sum of semester

	Lect	Tut	PW	Proj	WP	Asst	ECTS
Sum	24	0	0	0	0	0	30
Face-to-face sum	24						

Semester 10 - unit
INFO5-S10-NON-CONTRATS PRO

Stages de fin d'études

ECTS : 30

Manager : NORMAND Nicolas

Course	Lect	Tut	PW	Proj	WP	Asst	*Coef*
• Final Project					750		*1*
TOTAL	0	0	0	0	750	0	

Sum of semester

	Lect	Tut	PW	Proj	WP	Asst	ECTS
Sum	0	0	0	0	750	0	30
Face-to-face sum							

Part II

Sheets of courses

Advanced neural networks

Hours

Lect	Tut	PW	Proj	WP	Asst
8.75	4.5	3			

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Manager : Marc GELGON

Advanced object-orientated programming in Java

Hours

Lect	Tut	PW	Proj	WP	Asst
7.5	9	12			20

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Outline

- Encapsulation in OOP (Object Oriented Programming) and Java
  - Sub-typing in OOP and Java
  - Specialisation in OOP and Java
  - Other OOP principles
  - Other Java mechanisms
  - Good and bad practices in OOP

Goals

Object-oriented programming has become indispensable in the software industry, altogether in development processes (object-oriented design and languages), in popular frameworks (for example based on Java), or even in "imposed" languages (Javascript in web browsers).

In this course we study the principles of object programming and how the use of these principles and their exploitation in object-oriented languages improves the quality of the code (compared to a simple imperative language).

In addition, we will use the Java language. We will study the particularities of Java and the good ways of using them, still with the goal of having a source code of high quality.

Bibliography

La programmation orientée objet, Hugues Bersini Eyrolles; Édition : 5e édition (5 janvier 2011)

Design patterns, Eric Freeman, Editeur : O'Reilly Editions (22 septembre 2005)

Design Patterns: Elements of Reusable Object-Oriented Software, Erich Gamma, , Richard Helm, Ralph Johnson, John Vlissides, Addison-Wesley professional computing series

Prerequisites

C language

Learning outcomes

Learning outcomes	N	A	M	E	O
• OOP : understand and implement encapsulation	·	·	✓	·	·
• OOP : use encapsulation to get a good modularity	·	✓	·	·	·
• OOP : implement and use sub-typing	·	·	✓	·	·
• OOP : use sub-typing to get a good genericity	·	✓	·	·	·
• OOP : implement and use specialisation (sub-classes, inheritance)	·	·	✓	·	·
• OOP : use specialisation to get a good reuse rate	·	✓	·	·	·
• OOP : understand the differnece between instance members and class member.	·	·	✓	·	·
• Java : understand the language mechanisms : overloading, primitive types, dynamic and static dispatch, methods of the Object class, polymorphc parametrism, enum types, exceptions...)	·	·	✓	·	·
• Java : Understanding a limited part of the standard library (Collections in particular)	·	·	✓	·	·

Manager : Julien COHEN

Advanced software project in Java

Hours

Lect	Tut	PW	Proj	WP	Asst
		1.5			30

Evaluation

One evaluation : *Projet*

Outline

- Modeling a problem in the object paradigm
  - Implementation in C ++

Goals

Practicing object modeling and implement it in C ++.

Bibliography

- Bjarne Stroustrup, The C++ Programming Language, Addison Wesley Longman edts
  - Scott Meyers. 2014. Effective Modern C++: 42 Specific Ways to Improve Your Use of C++11 and C++14 (1st ed.). O'Reilly Media, Inc.

Prerequisites

- Advanced object programming: C ++

Learning outcomes

Learning outcomes	N	A	M	E	O
• Modeling a problem as an object model	·	·	✓	·	·
• Propose solutions to implement the model in C ++	·	·	✓	·	·
• Analyse a real-world problem	·	✓	·	·	·

Manager : Julien COHEN

Algorithmic competitive project with python

Hours

Lect	Tut	PW	Proj	WP	Asst
3.75		6			20

Evaluation

One evaluation : *Projet*

Presentation

The very first large scale development project in the INFO dpt.

Outline

- Modeling of a problem
  - creation of data structures and algorithmic to solve the problem
  - Implementation in Python

Goals

Practice simple algorithmic modeling and apply it with the Python language.

Prerequisites

Algorithmic

Learning outcomes

Learning outcomes	N	A	M	E	O
• Modeling a problem in the form of an algorithm	·	·	✓	·	·
• Propose appropriate data structures	·	✓	·	·	·

Manager : Guillaume RASCHIA

Algorithms & programming

Hours

Lect	Tut	PW	Proj	WP	Asst
16.25	4.5	24			30

Evaluation

3 evaluations :

- *Final*
- *Test1*
- *Test2*

Outline

1 Recursion
2 Linked structures
2.1 Linked lists
2.2 Stacks
2.3 Queues
3 Hash-Coding
4 Trees
4.1 Definitions and terminology
4.2 Binary tree
4.2.1 Pre-order, in-order, and post-order traversal
4.2.2 Binary search tree
4.2.3 AVL tree
4.3 (a-b) trees
4.3.1 (2-3-4) trees
4.3.2 B trees
4.3.3 B+ trees
4.4 Clustering tree
5 Graph data structures
6 Programming with deterministic finite automaton
7 External merge sort
7.1 Balanced multuway merging
7.2 Polyphase merge sort
Hands-on programming in python langage :
Recursion (Quicksort, towers of Hanoi, ...)
Stacks and linked lists
Binary search trees
Graphs

Bibliography

Christian CARREZ : "Structure de données en Java, C++ et Ada 95 : Pratique et outils de contrôle", Dunod 2000

Jacques COURTIN et Irène KOVARSKI : "Initiation à l'algorithmique et aux structures de données, volume 1", Dunod 1994

Jacques COURTIN et Irène KOVARSKI : "Initiation à l'algorithmique et aux structures de données, tome 2", Dunod 1997

D.E. KNUTH : "The art of computer programming : sorting and searching", Addison-Wesley 1973

Christine FROIDEVAUX, Marie-Claude GAUDEL, Michèle SORIA : "Types de données et algorithmes", Ediscience 1993

Prerequisites

Preliminaries algorithmis & programming

Learning outcomes

Learning outcomes	N	A	M	E	O
• Ability to rise the question of algorithm time complexity and distinguish it from computation time	·	✓	·	·	·
• Characterize the complexity of algorithms based on simple data structures	✓	·	·	·	·
• Ability to design algorithms and select suitable data structures on which these algorithms rely.	·	·	✓	·	·
• Implement algorithms with the python language.	·	·	✓	·	·

Manager : Philippe PETER

Architecture, supervision and network management

Hours

Lect	Tut	PW	Proj	WP	Asst
9	1				8

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Outline

It describes the implementation constraints of a network using a layered model for services (cloud) to the material:
- Deepening of the protocol stack TCP / IP hybrid networks reminder functions, application
- Study design and necessary means of achieving
- Study of the required quality of service and election processes for making
- Study of network availability and choice of implementation
- Study of information security through the application and the network
- Summary of constraints and proposed methodologies for achieving

Labs : Dynamic Routing with OSPF

Goals

This course synthesizes different learning seen in previous years in the field of networks with two main objectives:

Being able to understand the design of services carried by an IP network infrastructure through its various components.

Being able to conduct a full audit of IP infrastructure supporting services.

Bibliography

L'Architecture des réseaux IP (Hervé BRIAND)

Computer Networks, Andrew Tanenbaum

Prerequisites

Mastery of basic IPv4 networks, IPv6

Knowledge of network elements involved in the security infrastructure

Knowledge of the service quality, concepts of IP / MPLS

Knowledge of the OSI model

Learning outcomes

Learning outcomes	N	A	M	E	O
• Analyzing network specifications of the client, classify it related to the constraints of protocols, dimensioning, QoS, availability, security and architecture	·	·	✓	·	·
• To be able to go one step beyond the explicit propositions in order to define implicit one to answer to the question	✓	·	·	·	·
• To define architectural answers thanks to a network toolbox	·	✓	·	·	·

Manager : Benoit PARREIN

Business Simulation 1

Hours

Lect	Tut	PW	Proj	WP	Asst
			24		2

Evaluation

One evaluation : *Soutenance + CC*

Goals

Put into practice teachings " HES " in a global approach of the company by integrating its various economic, commercial, financial, human dimensions.

Understand the link between these dimensions.

Understand the enterprise by using a concrete case.

Prerequisites

accounting and economics

Learning outcomes

Learning outcomes	N	A	M	E	O
• to implement the theoretical concepts Economics and management which were taught in the 3rd year	·	✓	·	·	·
• managing a virtual enterprise by intégrating the different dimensions of the company, in a team and in a limited time	✓	·	·	·	·

Manager : Chrystèle GONCALVES

Business Simulation 2

Hours

Lect	Tut	PW	Proj	WP	Asst
20.5					10

Evaluation

One evaluation : *Contrôle continu*

Outline

Management of a virtual company in competitive environment. Taking of decisions, from the production organisation until the marketing.

Realization of specific works at the same time as the decisions of management :
- Strategic presentation of the company
- Dashboards
- Negociation...

Goals

Synthesize and put into practice teachings " HES " in a global approach of the company in international environment by integrating its various economic, commercial, financial, human and sociatal dimensions, into a perspective of sustainable development. Use on a concrete case tools and methods such as project management, dashboards, negotiation ...

Bibliography

Celles des cours précédents.

Prerequisites

All the courses HES of 3rd and 4th year, in particular the simulation of the business management of 4th year.

Learning outcomes

Learning outcomes	N	A	M	E	O
• Report its work under an appropriate shape.	·	·	✓	·	·
• Manage projects in team in an allotted time.	·	·	✓	·	·
• Manage a virtual company by integrating all the dimensions into a perspective of sustainable development.	·	✓	·	·	·
• Know how to set up simple dashboards.	·	✓	·	·	·
• Know how to practise a commercial negotiation.	·	✓	·	·	·

Manager : Jacques MOREAU

C language

Hours

Lect	Tut	PW	Proj	WP	Asst
10	1.5	13.5			12

Evaluation

One evaluation : *Examen*

Outline

1. Fundamentals
   2. Variables, data types
   3. Iuput/Output
   4. Expressions and Operators
   5. Flow control structures
   6. Functions
   7. Structures
   8. Preprocessor
   9. Pointers
   10. Memory operation
   11. Functions 2
   12. Input/Output 2: File Management
   13. Compiler options, use of libraries and debugging
   14. Standard library

Goals

The objective of this course is to learn the basics of programming. From a basic understanding of functional programming in C, we will deepen the inherent mechanisms of the C language and of the memory management of a computer, to prepare students for learning modern programming paradigms.

Bibliography

Brian W. Kernighan et Dennis M. Ritchie, Le Langage C

Prerequisites

- Algorithms

Learning outcomes

Learning outcomes	N	A	M	E	O
• Know how to implement an algorithm in C language	·	·	✓	·	·
• Know to structure the memory of a program	·	·	✓	·	·
• Know how to use the input/output mechanisms of the C language	·	·	✓	·	·
• Know the standard C library	·	✓	·	·	·

Manager : Fabien PICAROUGNE

Classical Logics

Hours

Lect	Tut	PW	Proj	WP	Asst
7.5	10.5				18

Evaluation

One evaluation : *Théorie*

Presentation

A practical introduction to classical logics: propositional logic and predicate logics with or without equality. The course emphasizes on reasoning's translation from natural language to logical formalisms and studies several proof methods. A summary on theoretical logic resumes the foundations of formal logic and gives main theoretical results.

Outline

1. Introduction: Notion of logics - Interests of logics
   2. Propositional logic: Proposition - negation, conjunction, disjunction
   Main propositional equivalences
   Translations of statements and arguments in current language
   Validation of arguments represented by logical formulas
   Semantic methods: truth tables, semantic trees ...
   Syntactic methods: resolution method ...
   3. First order predicate logic
   Notion of predicate - Quantifiers - Main logical equivalences
   Transcription of predicative arguments Manipulation of predicative formulas
   Proof methods: semantic tree method - resolution method
   4. Other classical logics: predicates with equality - second order predicates
   5. Elements of theoretical logic: formal syntax, formal deduction, formal semantics.
   Consistency, completeness, decidability

Goals

Logic concept is the root of a number of compter science paradigms : relational data management languages, satisfaction problems, model-checking.

Upon completion, the students will modelize and formalize in a logical way some practical problems. They will also be able to manipulate, prove the validity of formulas written in the two main used logics: propositional logic and first-order logic.

Bibliography

BEN-ARI M. ; « Mathematical Logic for Computer Science » ; Prentice-Hall, 1993
JASON G. ; « Introduction to Logic » ; Jones and Bartlett, 1994
REEVES S., CLARKE M. ; « Logic for Computer Science » ; Addison Wesley, 1990
RUBIN J. E. ; « Mathematical Logic: Applications and Theory » ; Saunders College Publishing, 1990

Prerequisites

No prerequisite

Manager : Hoël LE CAPITAINE

Communicating on the workplace / Intercultural communication

Hours

Lect	Tut	PW	Proj	WP	Asst
3	10.5				5

Evaluation

One evaluation : *Contrôle continu*

Outline

The sessions will alternate lectures, practical exercises, simulations, collective debriefing.

10,5 hours in groups will be dedicated to Communication at work, and 2,5 hours of lecture to Intercultural communication.

Goals

To discover the various facets of business communication.

To lean how to observe interpersonal or goup communication situations, to analyse them and to adjust one's communication style.

To be able to express oneself in public.

To present the challenges and the major principles of the intercultural communication.

Bibliography

La communication en entreprise, J-P. Lehnisch, PUF, coll. Que sais-je ?, 2011

Comment leur dire... La process communication, G. Collignon, Inter-Editions, 2010

Prerequisites

Minimal knowledge on companies.

Learning outcomes

Learning outcomes	N	A	M	E	O
• To be able to distinguish the different forms of communication in business	✓	·	·	·	·
• To be able to observe and analyze a communication situation	·	✓	·	·	·
• To be able to understand the effect of one's communication style and to adjust it	·	✓	·	·	·
• To be able to express oneself in public	·	✓	·	·	·
• To understand the stakes connected to the intercultural communication	✓	·	·	·	·
• To know the main theories, the models and the tools of analysis of the interculturalism	✓	·	·	·	·

Manager : Anouk GREVIN

Computational geometry

Hours

Lect	Tut	PW	Proj	WP	Asst
8.75	6				13

Evaluation

One evaluation : *Théorie*

Outline

Sampling
- Neighborhood relation
- Digital connectedness, connected component extraction
- Digital convexity, convex hull computation
- Discrete straight line (DSL)
- Arithmetical line (Figueiredo-Reveillès)
- Line plotting
- Discrete angles
- Farey sequences
- Mojette transform
- Discrete polygons
- Pick's theorem
- Shape filling
- Discrete distances

Goals

Overview of computational and digital geometry for computer scientists

Prerequisites

Basic notions of geometry, linear algebra, number theoriy

Manager : Nicolas NORMAND

Computer and operating systems 1

Hours

Lect	Tut	PW	Proj	WP	Asst
8.75	1.5	24			10

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Outline

1. Harware architecture of computers
2. Software architecture of computers: operating systems
3. Management of processus
4. Memory management
5. History of computers
6. Initiation to Unix

Goals

To understand the architecture of a computer : basic concepts, components and functions of a computer in term of hardware and software (operating system). Application to unix system during the labs.

Prerequisites

None

Learning outcomes

Learning outcomes	N	A	M	E	O
• To know the components of a computers and their interactions	·	✓	·	·	·
• To understand the functions and the structure of an operating system	·	✓	·	·	·
• To know the mecanisms of process and memory management	·	·	✓	·	·
• To use the basic user commands in Unix	·	·	✓	·	·
• To use the advanced features in unix (find, regexp, redirections, process management, shell scripting,...)	·	·	✓	·	·
• coding with basic function of unix API in C	·	·	✓	·	·

Manager : Fabrice GUILLET

Computer networks 2 - Protocol design

Hours

Lect	Tut	PW	Proj	WP	Asst
	9	9			12

Evaluation

One evaluation : *Pratique*

Presentation

Students are led to design a protocol stack in order to exchange between network entities. Different types of architectures and service levels are used (ring, packet, layers, multiplexing, connected mode, unconnected mode).

Outline

Work in groups (3 to 4 students per group):

1- Specification: design of the protocols
2- Internet programming in labs
3- Realization of a mini-project

Goals

To design a protocol stack in order to communicate through the network, with different types of architectures and levels of service.

Prerequisites

Networks 1

Programming (C and Python)

Learning outcomes

Learning outcomes	N	A	M	E	O
• To specify a network protocol with layers.	·	·	✓	·	·
• To know how to program of a network protocol (Internet programming).	·	✓	·	·	·

Manager : Vincent RICORDEL

Computer networks 3

Hours

Lect	Tut	PW	Proj	WP	Asst
10	1.5	12			17.5

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Outline

Internet history
Global view
Link protocols : ethernet, PPP, ARP
Network protocols : IPv4, IPv6
Transport protocols : UDP, TCP
Self-configuration and naming : stateless configuration (IPv6), DHCP, DNS, LDAP
Application protocols : HTTP, SMB, CIFS

Goals

Discovering the architecture and the protocols of Internet

Bibliography

Guy Pujolle, « Les réseaux », Eyrolles, 2008

Laurent Toutain, « Réseaux locaux et Internet, des protocoles à l'interconnexion », Hermes, 2003

Charles Spurgeon, « Charles Spurgeon's Ethernet Web Site », http://wwwhost.ots.utexas.edu/ethernet

Barry M. Leiner, Vinton G. Cerf, David D. Clark, Robert E. Kahn, Leonard Kleinrock, Daniel C. Lynch, Jon Postel, Larry G. Roberts, Stephen Wolff, « A Brief History of the Internet », http://www.isoc.org/internet/history/brief.html

Prerequisites

Computer basics (information coding)

Learning outcomes

Learning outcomes	N	A	M	E	O
• Understanding the Internet functionning	·	·	✓	·	·
• Designing a local network architecture	·	✓	·	·	·
• Interconnecting local networks	·	·	✓	·	·
• Connecting local networks to the Internet	·	·	✓	·	·
• Deploying Internet applications	·	✓	·	·	·

Manager : Rémi LEHN

Computer networks and security

Hours

Lect	Tut	PW	Proj	WP	Asst
11.25	3		9		23

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Presentation

This course is centered on the mini-project that focuses on the broad theme of networks. It is to be completed in binoms using largely homework. On the organizational point of view, it is the mini-application of the methodology for the project acquired in 4th year with a bibliographical phase, design and implementation. Magistral courses introduce topics not covered previously in training (access networks, wireless networks and quality of service).

Outline

* Physical layer and access
  * Access Networks
  * Wifi networks and ad-hoc
  * Quality of Service (definitions and implementations)
  * P2P Networks

  Mini-project
  * presentation and selection of the subject
  * bibliography and requirements (within 4 pages)
  * demo

Goals

To like computer networks

To start news topics not covered (or partly covered) in lecture

To prepare to the 5th year (RSC courses)

Bibliography

Laurent Toutain, Réseaux Locaux et Internet, Hermès, 2003 , 844 p. ISBN 2-7462-0670-6

Prerequisites

Networks notion (of S5), Networks, Cryptography

Learning outcomes

Learning outcomes	N	A	M	E	O
• Starting some new problems initiated in lectures in a project	·	✓	·	·	·
• Driving a project with deliverables, realisation and demonstration	·	·	✓	·	·
• Understanding quality of service in a local and wide area network	·	·	✓	·	·
• Caracterizing and scheduling a traffic	·	·	✓	·	·
• Understanding P2P networks	·	·	✓	·	·

Manager : Benoit PARREIN

Computer-based knowledge engineering

Hours

Lect	Tut	PW	Proj	WP	Asst
15	9	12			14.5

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Outline

1. Introduction to Knowledge Management
   Issues and challenges. Typology of knowledge. Corporate memory. Knowledge life cycle. Case Study.
   2. Tools for knowledge management
   Groupware, workflow. Electronic Document Management (EDM). Knowledge mapping.
   3. Knowledge extraction/elicitation
   Practical guide. Advices and feedbacks
   4. conceptual methods
   KADS, MKSM
   5. Knowledge modeling
   Semantic networks. Conceptual graphs. Description logics. XML tools. To ontologies (RDF and OWL). Transposition in prolog.
   6. Case studies
   With XML. With software knowledge management (Atanor)

Goals

The objective is to present knowledge management in the frame of knowledge modeling in computer sciences

Bibliography

Ermine J.-L. ; Les systèmes de connaissances ; Hermès, 1996

Zacklad M., Grundstein M. (Ed.) ; Ingénierie des connaissances et capitalisation des connaissances ; Hermès, 2001

Schreiber G., et al. ; Knowledge Engineering and Management : The CommonKADS methodology ; MIT Press, 1999

Manager : Fabrice GUILLET

Concurrency in algorithms

Hours

Lect	Tut	PW	Proj	WP	Asst
6.25	4.5	6			11

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Presentation

This course introduces the issues of competition due to parallelism of processes on a computer. Then presents the solutions available through the mechanisms of competition management and synchronization available, either in systems or in programming languages.

Outline

C1: process and threads
C2: Competition and Mutual Exclusion
C3: solutions with active waiting loop
C4: semaphores and monitors (Petri nets)
C5: producers / consumers
TD1: mutual exclusion, dead lock,
producers / consumers (semaphores)
TD2: producers / consumers (monitors)
TP1: coding TD1 in Python (semaphores)
TP2: coding TD2 in Python (monitors)

Goals

Understand competition mechanisms / process competition on common resources.
Master the notion of heavy and light process (thread)
Master the notions of critical resource, critical section, mutual exclusion, synchronization.
Master the concepts of semaphores and monitors.
Knowing how to use the Petri nets to model a competition problem and solve it.
Solve the problems of mutual exclusion, fatal embrace, alternation, producers / consumers.
Apply by coding these mechanisms on threads in Python language.

Prerequisites

Basics of computer architecture (process and program execution, finite state machines)
Basics of graph theory
Python language

Manager : Fabrice GUILLET

Confidentiality enhancement

Hours

Lect	Tut	PW	Proj	WP	Asst
5					6

Evaluation

One evaluation : *Théorie*

Consolidation in linear algebra and calculus

Hours

Lect	Tut	PW	Proj	WP	Asst
	13.5				10

Evaluation

One evaluation : *controle*

Outline

vector spaces
- linear applications
- matrix calculations
- distances, norms, scalar product
- example applications that require linear algebra
- a few informal examples about computational complexity
- integration
- derivation
- complex numbers
- a few words and examples about computer environments for maths (R,matlab,python)

Goals

In this topic, we cover fundamental concepts in linear algebra and calculus, that we estimate necessary for a computer science curriculum. We take care to relate these topics to computer science (both why these maths are useful and how computer can make these mathematical calculations).

Learning outcomes

Learning outcomes	N	A	M	E	O
• Ability to model and formalize simple real problems in mathematical terms, with variables, linear algebra and/or calculus.	·	✓	·	·	·
• Ability to make common calculation (by hand, not with a computer)	·	✓	·	·	·
• Be aware of the tight between computer science (modelling aspects, computing aspects)	·	✓	·	·	·

Manager : Marc GELGON

Continuous Assessment (bis)

Hours

Lect Tut PW Proj WP Asst

Evaluation

One evaluation : *CC*

Contrat pro - S10

Hours

Lect Tut PW Proj WP Asst

Evaluation

One evaluation : *pratique*

Manager : Nicolas NORMAND

Core and Access Networks

Hours

Lect	Tut	PW	Proj	WP	Asst
5	1	12			6

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Outline

Metro-Ethernet (Louis Legouriellec, Alcatel-Lucent/Fizians)

1. What & Why? Opportunity for Carrier Metro Ethernet Services
2. How? Implementation of Metro Ethernet connectivity services
3. How? The OSS aspect
4. How? Example of equipment architecture
5. Technology evolution

MPLS
Introduction, terminology, components, labels allocation and distribution, AtoM, MPLS VPN
MPLS Lab

Goals

Understand provider networks like core and access networks

Bibliography

Protocole MPLS, Adrien Genillier, Supports de cours, Polytech Nantes

Prerequisites

Networks architecture

Manager : Benoit PARREIN

Cryptography

Hours

Lect	Tut	PW	Proj	WP	Asst
8.75	6				13.25

Evaluation

One evaluation : *Théorie*

Presentation

Applied cryptography introduction

Outline

1. Ciphering history
   2. Ciphering by secret key - DES protocol
   3. Ciphering by public key - RSA algorithm
   4. Authentication and digital signature
   5. Secure communication
   6. Notion of PKI infrastructure
   7. Blockchain introduction

Goals

This course aims to give necessary theoretical skills to understand security protocols and algorithms.

Bibliography

Bruce Schneier, Cryptographie appliquée, Wiley, 2001, 846 p.

Prerequisites

Information theory

Learning outcomes

Learning outcomes	N	A	M	E	O
• Describing a symmetric ciphering algorithm (currently used)	·	·	✓	·	·
• Describing a asymmetric ciphering algorithm (currently used)	·	·	✓	·	·
• Understanding private/public keys mechanism	·	·	✓	·	·
• Modular arithmetic (inverse function, exponent function)	·	·	✓	·	·
• Proposing elementary secured protocols	·	✓	·	·	·

Manager : Benoit PARREIN

Data analysis SILR

Hours

Lect	Tut	PW	Proj	WP	Asst
8.75	9	3			9.5

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Outline

1 Différent types of data
2 K-means
3 Hierarchical clustering
4 Principal component analysis
5 Simple correspondence analysis
6 Multiple correspondence analysis
7 Applications with R software

Goals

Recognize different types of data.
Present the principal methods of data analysis.
Interpret the results given by data analysis methods.

Bibliography

G. Celeux, E. Diday, G. Govaert, Y. Lechevallier, H. Ralambondrainy : classification automtique des données (Dunod, 1989).

G. SAPORTA : Probabilités, analyse des données et statistiques, troisième édition (Technip, 2011)

F. HUSSON, S. LÊ, J. PAGES : Analyse des données avec R. Collection (Didact Statistique - PU Rennes 2009).

Prerequisites

Linear algebra
Algorithms

Manager : Philippe PETER

Data mining project

Hours

Lect	Tut	PW	Proj	WP	Asst
2.5		4.5			10

Evaluation

One evaluation : *Pratique (projet)*

Goals

Implement a data warehouse architecture, the extraction processes, and the exploration and analysis processes.

Prerequisites

Databases
- Database and Datawarehouse Design
- Data mining

Manager : Julien BLANCHARD

Data quality

Hours

Lect	Tut	PW	Proj	WP	Asst
6.25	2.75	3			8

Evaluation

2 evaluations :

- *DS*
- *TP*

Manager : Guillaume RASCHIA

Data visualization

Hours

Lect	Tut	PW	Proj	WP	Asst
12.5	1.5	7.5			15

Evaluation

2 evaluations :

- *Pratique*
- *Théorie*

Outline

1- Introduction
2- Data representations : basic techniques
3- Trees and networks : static layouts, dynamic layouts and large graphs
4- Metrics : isometrical embeddings and approximations
5- Virtual reality and metaphors
6- 3D representations

Goals

Presentation of various aspects of visualization in the field of knowledge extraction. Visual data mining is appropriate for discovering structures (e.g. clusters, bumps, trends, associations). The course develops basic techniques specially adapted to different types of data (e.g. Graphs, metric spaces) and discusses their limits for very large data sets. Recent strategies including human-centered approaches and 3D supports are also presented to tackle high dimensional data.

Bibliography

Fayyad U. , Grinstein G.G., Wierse A. (2002). Information visualization in data mining and knowledge discovery, Morgan Kaufman Pub. - Telea A. (2007). Data visualization : Principles and practice, A.K. Peters Ldt - Ware C. (2000). Information visualization - Perception for design, Morgan Kaufman Pub.

Prerequisites

Data analysis - Graph theory

Manager : Pascale KUNTZ-COSPEREC

Database query processing

Hours

Lect	Tut	PW	Proj	WP	Asst
6.25	7	3			15

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Manager : Guillaume RASCHIA

Database security

Hours

Lect	Tut	PW	Proj	WP	Asst
2.5	1	5.5			6

Evaluation

One evaluation : *Théorie*

Design of databases and data warehouses

Hours

Lect	Tut	PW	Proj	WP	Asst
10	3	12			14.5

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Outline

Data warehouse overview
Extract, Transform and Load
Data administration
Build normalized and multi-dimensional models
Fundamentals of data warehousing
Data Warehouse Systems Architecture and Optimization,
Data warehouse project planning

Goals

The main objective of this course is to introduce the general architecture of the data warehouses by focusing more particularly on the user point of view. The student will use a reporting tool from a predefined modelling.

Bibliography

Ramakrishnan R., et al. ; Database management systems ; McGraw-Hill, 2003
Jarke J., et al. ; Fundamentals of data warehouses ; Springer, 2002
Akoka J., et al. ; Entrepôts de données et bds multidimensionnelles ; Hermès Lavoisier,2002
Adelman S., et al. ; Data warehouse project management ; Addison Wesley, 2004

Manager : Marie-Pierre NACHOUKI

Digital trace analysis

Hours

Lect	Tut	PW	Proj	WP	Asst
3.75	1.5	3			5

Evaluation

One evaluation : *Théorie*

Outline

1.Temporal Database
- Introduction on temporal DB
- Temporal DB model
- Temporal query
- Temporal index

2.Pattern Mining

3.Process Mining
- Process mining introduction
- Alpha Algorithm
- Heuristic Miner Algorithm
- Conformance checking

Bibliography

C. Claramunt and M. Theriault
Managing Time in GIS: An Event-Oriented Approach.
Proceedings of the International Workshop on Temporal Databases: Recent Advances in Temporal Databases, 1995.
C. H. Mooney and J. F. Roddick
Sequential pattern mining - approaches and algorithms
ACM Computing Surveys, vol. 45(2), pp. 1-39, 2013.
C. S. Jensen , R. T. Snodgrass , M. D. Soo
The TSQL2 Data Model.
The Springer International Series in Engineering and Computer Science, Vol. 330
C. E. Atay
A Comparison of Attribute and Tuple Time Stamped Bitemporal Relational Data Models.
Proceedings of the International Conference on Applied Computer Science, 2010.
P. Fournier-Viger, J. C.-W. Lin, R. U. Kiran, Y. S. Koh, R. Thomas
A Survey of Sequential Pattern Mining
Data Science and Pattern Recognition, vol. 1(1), pp. 54-77, 2017.
W. M.P. van der Aalst
Process Mining, Discovery, Conformance and Enhancement of Business Processes.
Springer, 2011.

Manager : Antoine PIGEAU

Discovering scientific research

Hours

Lect	Tut	PW	Proj	WP	Asst
2.5	3.5				1

Evaluation

One evaluation : *Contrôle sur table*

Presentation

The research teams composing most of the pedagogical forces of the INFO department present their research. This leads to team laboratory visits by engineering students to discover research focus points with demonstrations and explanations of the research characteristics involved.

In parallel, explanations are provided from lesson to show what is the purpose of research for the economic world, what are the links woven by engineers working in companies with public laboratories, and finally what are the types of jobs in the research word either public or private.

Outline

1- Why doing research in Europe ?
- 2- Who is doing research in France ?
- 2-1 at the University
- 2-2 in the company
- 3- Research at the University
- 3-1 Master & Ph.D. student
- 3-2 Postdoc
- 3-3 assistant prof and prof
- 4- Research in a company
- 4-1 internal research
- 4-2 collaborative research project
- 4-3 links between companies and publics labs

Goals

The aim is to give a global vision of the missions, processes and careers of scientific research. In fact, research is one of the ways for graduate engineers, PhDs or research engineers, in public or private laboratories. It is a trajectory better prepared when done at early stage. The engineer in enterprise, start-up or large group, may also be required to collaborate, for its innovations, with a research laboratory.

The educational activity will be partly based on LS2N research team visits. This activity follows the interviews of researchers made in the 3rd year in HES "Discovery of trades".

Prerequisites

none

Manager : Jean-Pierre GUEDON

Distributed and Cooperative Systems

Hours

Lect	Tut	PW	Proj	WP	Asst
10	1.5				6

Evaluation

One evaluation : *Théorie*

Outline

Distributed algorithms
- Definitions and limitations
- Some fundamental algorithms

Peer-to-peer systems
- Applications to decentralized collaborative software design

Goals

Actually distributed applications, i.e., without centralised control, are subject to inherent limitations that have to be understood in order to develop distributed algorithms. One can then differentiate between algorithms with "strong" guarantees, and distributed applications where participants have a lot of freedom, such has peer-to-peer applications.

Bibliography

Tanenbaum A., van Steen M. ; Distributed Systems: Principles and Paradigms ; Prentice-Hall
Raynal M. ; La communication et le temps dans les réseaux et les systèmes répartis, Tome 1 ; Eyrolles
Raynal M. ; Gestion de données réparties : problèmes et protocoles, Tome 2 ; Eyrolles
Raynal M. ; Synchronisation et état global dans les systèmes répartis, Tome 3 ; Eyrolles

Prerequisites

Main notions of networks and systems, graph theory, processes modelling, functional programming, algorithmics, and databases

Learning outcomes

Learning outcomes	N	A	M	E	O
• Deal with causality and logical timing	·	·	✓	·	·
• Ensure transactional properties	·	·	✓	·	·

Manager : José MARTINEZ

Electronic Document Management and digitization

Hours

Lect	Tut	PW	Proj	WP	Asst
7.5	1.5	9			10

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Outline

1 - Introduction
2 - Digitalizing
3 - Pre processing
4 - Recognition
5 - Electronic Document Management System

Goals

The objective of this course is to present the issues and technologies dedicated to printed documents in information systems. In particular, how to identify the issues raised by the dematerialization of structured documents of all types and provide solutions in terms of Automatic Document Reading and indexation.

Bibliography

- Rabiner, L. and Juang, B. : An introduction to hidden Markov models, ASSP Magazine, IEEE, 3(1), 1986.
- Beliad, A. : Reconnaissance automatique de l'écriture et du document. Pour la Science, 2001.

Prerequisites

- probabilities
- image processing

Manager : Hoël LE CAPITAINE

Ethical, social and environmental issues in computer science

Hours

Lect	Tut	PW	Proj	WP	Asst
9					

Evaluation

One evaluation : *Evaluation*

Manager : Pascale KUNTZ-COSPEREC

Experience feedback

Hours

Lect	Tut	PW	Proj	WP	Asst
24					

Evaluation

One evaluation : *Validé / non validé*

Manager : Maud BEAUTRAIS SATTLER

Exploratory data analysis

Hours

Lect	Tut	PW	Proj	WP	Asst
11.25	4.5	9			16

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Outline

1- Introduction
2- Principal Component Analysis
3- K-means
4- Hierarchical classification

Goals

Introduction to exploratory data analysis (Principal Component Analysis and Automatical Classification)

Bibliography

Barthélemy J.P., Brucker F.(2007). Eléments de classification, Hermès
A.G. Gordon (1999). Classification, Chapman & Hall
Saporta G. (2011). Probabilités, analyse de données et statistiques, Editionstechnip

Prerequisites

Descriptive statistics

Manager : Pascale KUNTZ-COSPEREC

Expressing work and competences from company-related work

Hours

Lect	Tut	PW	Proj	WP	Asst
			10	300	

Evaluation

One evaluation : *Analyse compétences*

Manager : Marc GELGON

Final Project

Hours

Lect	Tut	PW	Proj	WP	Asst
				750	

Evaluation

One evaluation : *Pratique*

Goals

The purpose is to perfect the training of engineering students in real-life work experience inside a company. The student enhance his technical, organisational and human skills by being subject to the daily difficulties and contingencies of an engineer.

Manager : Nicolas NORMAND

Financial Mathematics

Hours

Lect	Tut	PW	Proj	WP	Asst
	10.5				2

Evaluation

One evaluation : *Théorie*

Outline

CHAPTER 1: FINANCIAL MATHEMATICS
- I. Interest rates: simple and composed
- II. The concepts of discount and capitalization
- III. Annuities: capitalized and updated

CHAPTER 2: THE DEBTS
- I. The different types of loans and the criteria for choosing between financial companies
- II. The calculation of annuity loan in the case of a loan in equal installments
- III The loan amortization schedule
- IV Loan renegotiation
- V The tax impact of debt

Goals

The goal of the course is to know the financial mathematics, to discuss in detail the calculation of debts, and the choice of borrowings.

Bibliography

"Mathématiques financières", Walder Masiéri, Dunod, 2ème édition

Manager : Chrystèle GONCALVES

Fourier analysis

Hours

Lect	Tut	PW	Proj	WP	Asst
	13.5				10

Evaluation

One evaluation : *Théorie*

Outline

1. Intuitions and applicative uses of the frequential representation
   2. Vector spaces
   3. Fourier series : definition, properties, exercises
   4. Fourier transform : definition, properties, exercises
   5. Convolution
   6. 2-dimensional Fourier transform

Goals

This set of mixed lecture/exercise sessions presents Fourier analysis, which is fundamental to several applications and further studies in signal and image processing. It covers continuous-time function (vs. discrete-time signal processing). We cover Fourier series and Fourier transform, with an engineering viewpoint, rather than a «fundamental mathematics» perspective. It is also an opportunity to revise and practice.

Manager : Marc GELGON

French as a Foreign Language for engineering students

Hours

Lect	Tut	PW	Proj	WP	Asst
	18				

Evaluation

One evaluation : *CC*

French as a Foreign Language for engineering students

Hours

Lect	Tut	PW	Proj	WP	Asst
	18				

Evaluation

One evaluation : *CC*

Functional programming

Hours

Lect	Tut	PW	Proj	WP	Asst
5	6	7.5			3

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Outline

- Imperative Vs Functional programming
  - anonymous function, local functions
  - typing : polymorphism, higher order
  - iterators
  - algebraic data types (trees)
  - symbolic manipulation of expressions
  - introspection : interpretation of a functional language.

Goals

Functional programming and functional languages allow to make abstraction of the hardware and to focus on the problem to be solved, with resulting programs generally easier to write and to maintain (than imperative programs).

Although the origin of the functional languages is quite old, these languages or the concepts coming from these languages have been adopted late in the software industry, and we now find them in various areas (Erlang, F #, garbage collector, anonymous functions and higher order in C ++, Java and C # , parametric polymoprophism in Java...).

This goal of this lecture is to learn functional programming (with a functional language, here OCaml).

Learning outcomes

Learning outcomes	N	A	M	E	O
• Program an algorithm in a purely functional way (no side-effects)	·	·	✓	·	·
• Use higher order to get genericity and exploit reuse.	·	·	✓	·	·
• Implement data structures with algebraic types, handle them with pattern matching and iterators	·	·	✓	·	·
• Understand how the choice of the data structure influences the mantenability of the whole program	·	✓	·	·	·

Manager : Julien COHEN

Game Theory

Hours

Lect	Tut	PW	Proj	WP	Asst
8.75	1.5				4

Evaluation

One evaluation : *Théorie*

Outline

Module 1: Non-cooperative games
* Zero-sum games
* Nash equilibrium
* Pure and mixed strategies
* Backward induction
* Incomplete information games

Module 2: Cooperative games
* Coalitional games
* Bargaining game
* How to cooperate in a non-cooperative context?

Module 3: Application to negotiation

Bibliography

* Martin J. OSBORNE. An introduction to game theory, Oxford University Press, 2003.
* Murat YILDIZOGLU. Introduction à la théorie des jeux. Dunod, 2003.
* David KREPS. Théorie des jeux et modélisation économique. Dunod, 1999.

Prerequisites

If possible, basic notions in Preference Modelling or Multi-Criteria Decision Analysis or Social Choice Theory.

Manager : Julien BLANCHARD

Grammar and professional English 1

Hours

Lect	Tut	PW	Proj	WP	Asst
	40				

Evaluation

2 evaluations :

- *CC*
- *DS*

Grammar, Toeic and professional English 2

Hours

Lect	Tut	PW	Proj	WP	Asst
	39	2			

Evaluation

3 evaluations :

- *CC*
- *Tutorat*
- *Toeic*

Graph theory

Hours

Lect	Tut	PW	Proj	WP	Asst
11.25	7.5				23

Evaluation

One evaluation : *Théorie*

Outline

1- Introduction
2- Trees
3- Graph drawing and planar graph
4- Shortest path
5- Coloration

Goals

Introduction to problem modeling with graphs. Being able to apply the classical algorithms. Introduction to algorithmic complexity

Bibliography

Berge C. (1973). Graphes et hypergraphes, Dunod, Paris J.C. Fournier (2007). Graphes et applications 1 et 2, Lavoisier Diestel R. (1997). Graph theory, Springer Di Battista G. Eades P., Tamassia R., Tollis I.G. (1999). Graph drawing - Algorithms for the visualisation of graphs, Prentice-Hall Harary F. (1972). Graph theory, Addison-Wesley

Prerequisites

No pre-requisites

Manager : Pascale KUNTZ-COSPEREC

Human-computer interaction

Hours

Lect	Tut	PW	Proj	WP	Asst
5	7.5				8

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Outline

1- Introduction
2- The human par of HCI
3- Designing HCI
4- Evaluating HCI
5- Graphical system
6- MVC Architecture
7- Widgets
8- Swing : undo/redo
9- Internationalization

Goals

The goals are :
- discover Human Computer Interaction
- discover how to design and evaluate Human-Computer Interfaces
- discover the functionalities of a graphical system
- discover the architecture Model-View-Controler

Bibliography

Alan J. Dix, Janet E. Finlay, Gregory D. Abowd, and Russell Beale. Human-Computer Interaction. Prentice Hall International, 3rd edition, 2004.

Albert Janssens système X WINDOW, la bible du programmeur. Edition Eyrolles, 1993.

Jean-François Nogier Ergonomie du logiciel et design web. Dunod, 2005.

B. Shneiderman. Designing the User Interface, Strategies for Effective Human-Computer Interaction. Addison Wesley Publishing, 2005.

Jenifer Tidwell, Designing Interfaces, O'Reilly, 2011.

Prerequisites

JAVA programming
Object-oriented design and UML

Learning outcomes

Learning outcomes	N	A	M	E	O
• Know human perceptive and cognitive capabilities, be able to think about the user experience of a product	·	✓	·	·	·
• Know how to describe users and scenarios of a new product	·	✓	·	·	·
• Know when and how to evaluate an interactive product	·	✓	·	·	·
• Understand a user Interface system	·	✓	·	·	·
• Know the architecture modelization of a user interface	·	·	✓	·	·
• Know to implement a MVC architecture	·	·	✓	·	·

Manager : Yannick PRIE

Hyblab project : data, web and interdisciplinarity

Hours

Lect	Tut	PW	Proj	WP	Asst
			23		27

Evaluation

3 evaluations :

- *Soutenance*
- *Rapport de projet*
- *Rendu du code*

Presentation

The Hyblab project is an interdisciplinary project that proposes to Polytech students some team work with students from other schools and fields (design, arts, communication). They work by group on a common topic, provided by an external partner (media, company, public authority).

Outline

1. Explore, analyse and make sense of your data
   2. Find a story to tell, a message to convey
   3.Look for the best datavisalizations
   4.Participate to the graphic design
   5. Choose a data structures and software libraries
   6. Build the web application

Goals

An engineer in computer science should not only have technical skill but he should also be able to work in an heterogenous environment comprising team mates and client that do not share the same culture and vocabulary. The Hyblab project provides a first interdisciplinary experience that will be a key in asset in the professional life of young engineers.

This project aims at creating a web application what will help understanding, exploring, or enriching a data set provided by an external partner. The students will analyse the dataset in order to find / highlight relevant information. Then, they will have to find the best way to convey this knowledge through interactive visualizations.

Bibliography

- http://www.hyblab.fr
  - http://jplusplus.github.io/guide-du-datajournalisme/
  - https://github.com/mperreir/Hyblab/wiki

Prerequisites

- XML and web technologies
  - Human Computer Interaction
  - Statistical Processing of Information
  - Data Analysis
  - Databases

Learning outcomes

Learning outcomes	N	A	M	E	O
• Web development	·	·	✓	·	·
• Data analysis and visualization	·	✓	·	·	·
• Project management	·	✓	·	·	·
• Communication / collaboration with other disciplines	·	✓	·	·	·
• Graphic design	✓	·	·	·	·

Manager : Matthieu PERREIRA DA SILVA

Image processing

Hours

Lect	Tut	PW	Proj	WP	Asst
20	1.5	10.5			23

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Outline

Image representation, colour spaces, elementary statistical descriptors
Linear and median filtering, convolution
Fourier analysis, several other linear decompositions
Statistical image classification, regularization
Mathematical morphology
Multi-image geometry, image matching, motion analysis
Introduction to 3D computer graphics and tomography.

Goals

In this topic, students will get familiar with fundamentals of digital image processing : image representation, processing and applications. Image processing is at the same time a means of covering, with an applied perspective, many fundamental of mathematics that come useful in computer science : statistics, optimization, Fourier analysis, linear algebra.

Bibliography

Horaud R., Monga O. ; Vision par ordinateur : Outils fondamentaux ; Hermès, 1993
Bovik A. ; Handbook of Image and Video Processing ; IEEE/Academic press, 2000
Kunt M., Granlund G., Kocher M.; Traitement nume?rique des images ; Presses polytechniques Romandes, 1993
Jain A. K. ; Fundamentals of Image Processing ; Prentice-Hall, 1990

Prerequisites

Linear algebra
Elementary Fourier analysis
Statistics and probabilities
Information theory

Manager : Marc GELGON

Information systems design and modelling

Hours

Lect	Tut	PW	Proj	WP	Asst
11.25	7.5	3			8

Evaluation

2 evaluations :

- *Theorie*
- *Pratique*

Outline

1. Introduction: relational model
   2. The relational algebra and the relational calculus
   3. Database security and authorization
   4. Disk storage Indexing file structures and hashing
   5.Distributed databases and client-server architectures

Goals

This course inytroduces the fundamental concepts necessary for designing, using and implementing databases in a centralized and in a distributed environment.

Bibliography

Ramakrishnan R., et al. ; Database management systems ; McGraw-Hill, 2003

Gulutzan P., et al. ; Performance Tuning, 2nd Edition ; Morgan Kaufmann, 2001

Delmal P. ; SQL2-SQL3 : applications à Oracle ; Université de De Boeck, 2001

H. Garcia-Molina, J. Ullman, and J. Widom. ; Database Systems : The Complete Book ; Prentice Hall, 2008, (2nd edition)

Manager : Marie-Pierre NACHOUKI

Information theory

Hours

Lect	Tut	PW	Proj	WP	Asst
10	6				10

Evaluation

One evaluation : *Théorie*

Presentation

In this course, we present the basics of Shannon's information theory. The first part defines the concepts of entropy, reversible encoding of the source, and mutual information. The second part explains the theory of detectors-correctors codes. It is then put into practice with linear codes and cyclic codes on binary codes. To finish this part, we present some examples for packet loss.

Outline

Introduction with the notion of Information. Notion of source entropy. Computation of entropy for a given source and limits for the entropy. Notion of entropy of a system (joint entropy) and mutual information, channel capacity. To know and use standards algorithms of entropic compression (Huffman, Shannon-Fano). Notions of detetcing and correcting codes. Hamming correcting codes, linear correcting codes, cyclic correcting codes (CRC), Reed Solomon Codes.

Goals

Understand what Information is. To know how to handle the entropy notion and compute it for a given information source. Undestand the elements of an information system (source coding, channel coding, noise, associted decoding). To know how to implement a scheme of entropic compression.

Bibliography

A Mathematical Theory of Communication by Claude E. Shannon ... in the July and October 1948 editions of the Bell System Technical Journal [

Manager : Jean-Pierre GUEDON

Information visualization

Hours

Lect	Tut	PW	Proj	WP	Asst
10	1.5				6

Evaluation

3 evaluations :

- *Examen*
- *Construction visu*
- *Analyse visu*

Outline

1- Introduction: history an evolution of HCI
2- Design of interactive products: general process, users, scenriios, screens, navigation
3- Users' perceptive and cognitive abilities
4- User experience: importance, emotions in HCI, appropriation
5- Evaluate an interactive product: when, how?
6- Information visualisation: definition and objectives, history, principles
Many examples and small design/evaluation workshops.

Goals

Know the bases of Human-Computer Interaction and information visualisation from a non-technical point of view: knowing the users, designing interaction and interfaces, evaluating an interactive product. Be able to design better products and to interact with specialists (designers, ergonomists, etc.)

Bibliography

Alan J. Dix, Janet E. Finlay, Gregory D. Abowd, and Russell Beale. Human-Computer Interaction. Prentice Hall International, 3rd edition, 2004.

B. Shneiderman. Designing the User Interface, Strategies for Effective Human-Computer Interaction. Addison Wesley Publishing, 2005.

Jenifer Tidwell, Designing Interfaces, O'Reilly, 2011.

Prerequisites

Programming, project management.

Learning outcomes

Learning outcomes	N	A	M	E	O
• Know HCI history and be able to foresee its future	✓	·	·	·	·
• Know how to describe users and scenarios of a new product	✓	·	·	·	·
• Know when and how to evaluate an interactive product	✓	·	·	·	·
• Know human perceptive and cognitive capabilities, be able to think about the user experience of a product	✓	·	·	·	·
• Be able to analyse and design an information visualisation	✓	·	·	·	·

Manager : Yannick PRIE

Intercultural explorations

Hours

Lect	Tut	PW	Proj	WP	Asst
	18				

Evaluation

One evaluation : *CC*

Internet multimedia

Hours

Lect	Tut	PW	Proj	WP	Asst
2.5	1	8.5			6

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Outline

QoS introduction
End-to-end strategies
Forward Error Correcting code and Mojette code
Unequal Error Protection of information
Multiple description coding
Networks Strategies: IntServ and DiffServ
Applications
Labs:
- Initiation QualNet simulator
- DiffServ on QualNet
- QoS and VoIP (Telephony over IP)

Goals

To describe networks and coding mechanisms for transport and restitution of communicating multimedia services

Bibliography

Internet multimedia et temps réel, Susbielle JF, Eyrolles, 2000, 729 p.

JPEG2000 : Image Compression Fundamentals Standards and Practice, Kluwer International Series in Engineering and Computer Science, 2002, 642 p.

The Mojette Transform : Theory and Applications, J. Guédon et al., ISTE-Wiley, 2009, 273 p.

Prerequisites

Network and multimedia

Manager : Benoit PARREIN

Internship (4th year)

Hours

Lect	Tut	PW	Proj	WP	Asst
				400	

Evaluation

One evaluation : *evaluation*

Manager : Antoine PIGEAU

Introduction to artificial intelligence

Hours

Lect	Tut	PW	Proj	WP	Asst
10	6				16

Evaluation

One evaluation : *Théorie*

Outline

Introduction
- Short history and definitions

Exploratory Techniques
- State graphs and sub-problems graphs
- Recursive exploration and graph traversals
- Application to games

Heuristic Techniques
- Choice ordering, constraint propagation, cycle detection, A*, etc.
- Machine learning with neural networks

Goals

Basic tools in Artificial intelligence are well-defined. It is mostly about exploring search spaces, using algorithmic and/or heuristic techniques.

Bibliography

Hofstadter D. R. ; Gödel, Escher, Bach : les Brins d'une Guirlande Éternelle ; InterÉditions

Laurière J.-L. ; Intelligence artificielle : résolution de problèmes par l'Homme et la machine ; Eyrolles

Pearl J. ; Heuristiques : stratégies de recherche intelligentes pour la résolution de problèmes par ordinateur ; Cépaduès Éditions

Russel S. and Norvig P. ; Artificial Intelligence: A modern approach ; 3rd edition (2010), Prentice Hall

Prerequisites

Graph Theory; Combinatoric Notions; Data and Knowledge Modelling; Algorithmics

Learning outcomes

Learning outcomes	N	A	M	E	O
• Modelling a problem as a state transition problem	·	·	✓	·	·
• Exploring combinatorics search spaces	·	·	✓	·	·
• Provide heuristics	·	✓	·	·	·

Manager : José MARTINEZ

Introduction to calculability and complexity theories

Hours

Lect	Tut	PW	Proj	WP	Asst
5	6				14

Evaluation

One evaluation : *Théorie*

Outline

Introduction to the calculability theory
- Problems, algorithms, and calculabilty models
- Turing machines
- Problems undetermined, indecidable, semi-decidable, and decidable

Introduction to the complexity theory
- Reasonable coding schemes
- Asymptotic complexities
- Intractability, P, NP, and NPC classes

Goals

Computer-solved problems become more and more complex. However, a computer is unable to compute everything, both in practice and in theory!

The theoretical bases of these limitations are introduced. In that way, it is possible to avoid trying to solve an unsolvable problem, or reusing state-of-the-art solvers for the most complex and intractable ones.

Bibliography

Hopcroft J. E., Ullman J. D. ; Introduction to Automata Theory, Languages, and Computation

Garey M. R., Johnson D. S. ; Computers and Intractability : A Guide to the Theory of NP-completeness ; Freeman

Wolper P. ; Introduction à la calculabilité ; Dunod

Prerequisites

Mathematical Modelling (logic, set theory, graph theory...); Algorithmics

Learning outcomes

Learning outcomes	N	A	M	E	O
• Formalise a decision problem	·	·	✓	·	·
• Reduce from a problem to another	·	·	✓	·	·
• Enumerate computable sets	·	·	✓	·	·

Manager : José MARTINEZ

Introduction to computer networks

Hours

Lect	Tut	PW	Proj	WP	Asst
12.5	10.5	15			30.5

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Presentation

This first course about computer networks aims to drive the students to know their basics and in particular the OSI and TCP / IP stacks.

The course is completed by exercises (TD) and labs (TP).

Outline

1 - Basics and definitions

2 - Local Area Networks - Layer 1: Bit, media, cables

3 - Local Area Networks - Layer 2: Frame, non-hierarchical address, deterministic / non-deterministic MAC protocols, physical / logical topologies, common LAN technologies, LAN devices, segmentation

4 - Local Area Networks - Layer 3: Packet, hierarchical address, routing, IPv4, subnets, routers, ICMP, ARP, routed protocols, routing protocols, static / dynamic routing

5 - Local Area Networks - Layer 4: service levels, TCP / UDP, socket

6 - Local Area Networks - Layer 5: Sessions

7 - Local Area Networks - Layer 6: Data presentation

8 - Local Area Networks - Layer 7: Network applications (examples)

Goals

To know the fundamentals of computer networks.

Bibliography

A. Tanenbaum : Réseaux (éd. Prentice Hall, Pearson Education France, plusieurs éditions).

G. Pujolle : Les Réseaux (éd. Eyrolles, plusieurs éditions)

Prerequisites

Computer and operating systems 1

Learning outcomes

Learning outcomes	N	A	M	E	O
• To know the basics of computer networks.	·	·	✓	·	·
• To know the OSI and TCP/IP stacks.	·	·	✓	·	·
• To know how to size and configure a LAN.	·	✓	·	·	·

Manager : Vincent RICORDEL

Knowledge discovery in data

Hours

Lect	Tut	PW	Proj	WP	Asst
15	4.5	6			12.5

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Outline

1. Introduction to EDC
   What is KDD ("data-mining", "text mining", "knowledge-mining")?
   Industrial and scientific issues. KDD process and life cycle of knowledge. rule Discovery and rules.
   2. Knowledge discovery algorithms
   Learning techniques (supervised, unsupervised), classification. . . Decision Trees and graphs. A-Priori algorithm. Data mining tools and commercial software. Case study (Felix, SAS, Weka).
   3. Quality Measures in knowledge discovery
   Conventional indices and their limitations. Intensity of implication.
   4. Visualization tools
   How to choose a representation adapted to the nature of the data? Networks of rules. Illustrations.

Goals

The objective is to present the concepts, models and algorithms used in knowledge discovery in data (KDD), also so-called data mining.

Bibliography

Han J., Kamber M. ; Data Mining Concepts and Techniques ; Morgan Kaufmann, 2011.
Lefébvre R., Venturi G. ; Le Data Mining ; Eyrolles, 2000
Jambu M. ; Introduction au Data Mining ; Eyrolles, 1998

Prerequisites

Data analysis
Relational databases
Data warehouses
Graph Theory
Probability and statistics

Manager : Fabrice GUILLET

Knowledge-based systems project

Hours

Lect	Tut	PW	Proj	WP	Asst
		9			18

Evaluation

One evaluation : *Pratique*

Outline

Modelling a complex problem
  Solving it thanks to AI techniques
  Implementing it in Prolog

Goals

Practice Artificial Intelligence fundamentals.

Prerequisites

Artificial Intelligence Fundamentals; Recursive algorithms; Prolog

Learning outcomes

Learning outcomes	N	A	M	E	O
• Modelling a problem as a state transition problem	·	·	✓	·	·
• Exploring combinatorics search spaces	·	·	✓	·	·
• Provide heuristics	·	·	✓	·	·
• Analyse a real-world problem	·	✓	·	·	·

Manager : José MARTINEZ

Languages and translators

Hours

Lect	Tut	PW	Proj	WP	Asst
7.5	4.5	12			7.5

Evaluation

2 evaluations :

- *Théorique*
- *Pratique*

Outline

1 Language theory
1.1 Regular languages
1.2 Context-free languages
2 Compilation
2.1 Lexical analysis
2.2 Parsing (LL / LR)
2.4 Semantic analysis
2.5 Intermediate language translation

Goals

Present elements of language theory.
Write a translator between programming languages.
Write a compiler.

Bibliography

A.V. AHO, M.S. LAM, R. SETHI et J.D. ULLMAN : Compilers : principles, techniques and tools, 2nd editio) (Addison Wesley 2006).

J. LEVINE, T. MASON, et D. BROWN : Lex and Yacc (Editions O'Reilly International Thomson 1995).

Prerequisites

Algorithm and data structures
Notions of C (programming language)
Notions of assembler

Manager : Philippe PETER

Logic programming

Hours

Lect	Tut	PW	Proj	WP	Asst
3.75	3	7.5			13.5

Evaluation

One evaluation : *DS*

Outline

1 Logical basis of Prolog
- 1.1 Unification
- 1.2 Horn clauses
- 1.3 Resolution rule
- 1.4 How Prolog works
- 2 Logic programming using Prolog
- 2.1 Facts and rules
- 2.2 Lists, trees and graphs
- 2.3 Solve an AI problem with Prolog

Goals

Present logical programming with Prolog.
Program in Prolog.

Bibliography

L. STERLING, E. SHAPIRO : l'art de Prolog. Dunod 1990.
L. GACÔGNE : Prolog : programmation par l'exemple. Editions Hermann, 2009.

Prerequisites

Mathematical logic

Manager : Philippe PETER

Logical inference

Hours

Lect	Tut	PW	Proj	WP	Asst
6.25	9				16

Evaluation

One evaluation : *Théorie*

Presentation

This course is an overview of the main non-classical logics that may be used in computer science and its application areas.

Each chapter synthesizes one class of non classical logic, in order to enable students to use this logic. A particular emphasis on business intelligence is given during this course.

Outline

1. Introduction 2. Multivalued and fuzzy logics 3. Inductive Logic Programming 4. Markov Logic

Goals

Today, versatility of the data requires flexible tools tackling such complex structures. First order logic, already studied in the previous year, is used and enriched to produce and learn complex relationships among the data and extract knowledge from it.

Upon completion, the student will be able to use advanced tools of computational logic for knowledge discovery in modern data: big data, relational data, semantic web, etc ...

Bibliography

Priest G. An Introduction to Non-Classical Logic, Cambridge University Press, 2001

Russel S. , Norvig P. Artificial Intelligence : A modern approach, Prentice Hall 2009

Dzeroski, Saso. "Inductive logic programming in a nutshell." Introduction to Statistical Relational Learning [16] (2007).

Prerequisites

Classical logics

Manager : Hoël LE CAPITAINE

Logs and temporal data

Hours

Lect	Tut	PW	Proj	WP	Asst
2.5	0.5	3			3

Evaluation

One evaluation : *Théorie*

Outline

1- Introduction on temporal DB
2- Temporal DB model
3- Temporal query
4- Temporal index

Goals

Data storage can present difficulties when they have temporal properties: data evolving temporally or traces of events, where each event of the trace is dated. This type of data can be encountered in many areas.

For data evolving temporally, examples are the financial domain (stock values), the medical field (cancer evolution)

or the scientific field (meteorological data). Trace generation is related to the digitalization of companies, with a continuous data generation: each application

is likely to generate its traces. A field of application for this type of data is process mining, with the aim to

study the business processes performed by the employees or to detect fraud.

The objective of the course is to present the following technologies:

- temporal database
- methods for trace storage

Bibliography

Philippe Rigaux, Michel Scholl, Agnes Voisard
Spatial Databases, with application to GIS.
Morgan Kaufmann; 1 edition (June 1, 2001)
Claramunt, Christophe and Th eriault, Marius
Managing Time in GIS: An Event-Oriented Approach.
Proceedings of the International Workshop on Temporal Databases: Recent
Advances in Temporal Databases, 1995.
Christian S. Jensen , Richard T. Snodgrass , Michael D. Soo
The TSQL2 Data Model.
The Springer International Series in Engineering and Computer Science, Vol. 330
Canan Eren Atay
A Comparison of Attribute and Tuple Time Stamped Bitemporal Relational Data
Models.
Proceedings of the International Conference on Applied Computer Science, 2010.
Wil M.P. van der Aalst
Process Mining, Discovery, Conformance and Enhancement of Business Processes.
Springer, 2011.

Prerequisites

Relational data model
    Database Infrastructure
    Database implementation

Manager : Antoine PIGEAU

Long-term industrial project

Hours

Lect	Tut	PW	Proj	WP	Asst
7.5			86		100

Evaluation

One evaluation : *Pratique*

Goals

The third and final stage of the industrial project consists to implement, test and deliver the software which has been completely defined at the design stage. This phase allows equally to practice the technical skills of engineering students as their organizational skills, especially when faced with unexpected or last minute changes. In addition, the end of the project must be accompanied by a reflection on its relationship to environmental management. As an appendix to the main document, a short report will review this reflection.

Manager : Jean-Pierre GUEDON

Long-term industrial project 1

Hours

Lect	Tut	PW	Proj	WP	Asst
2.5			50		110

Evaluation

One evaluation : *Pratique*

Presentation

An innovative project is given by an industrialist to a trinomic engineering students. A teacher tutor is assigned to the project as well as a company tutor. The composite team will propose solutions for the project, model them and program them to have an operational solution at the end of the project.

Outline

An innovative project from a company is proposed for each trinomial students. This project includes bibliographic aspects, computer science, software engineering, and the humanities (with study or marketing oriented, sustainable development, change management, etc.). This semester, a pre-assessment software engineering (model V-cycle or agile) project will be realized.

Goals

To know how to drive innovative IT project proposed by a company group. To know how to discuss with the client to understand the expectations of the end user. To know how to build a specification and to the state of the art.

Manager : Jean-Pierre GUEDON

Management des connaissances d'entreprise

Hours

Lect	Tut	PW	Proj	WP	Asst
5	10.5				6

Evaluation

2 evaluations :

- *DS*
- *Etude de cas*

Manager : Philippe PETER

Managing people

Hours

Lect	Tut	PW	Proj	WP	Asst
	10.5				10.5

Evaluation

One evaluation : *Examen*

Outline

The sessions will alternate lectures, practical exercises, simulations, collective debriefing.

Goals

To understand the role of a manager and the paradoxes of management, main management issues, individual and organisational behavior.

To prepare oneself to leadership positions.

Bibliography

Management, l'essentiel des concepts et des pratiques, S. Robbins, D. DeCenzo, M. Coulter, Ed. Pearson.

Manageor, les meilleures pratiques du management, M. Barabel, O. Meier, Dunod.

Management et leadership, C. Dejoux, Dunod, coll. Les topos.

Prerequisites

Minimal knowledge on companies.

Team working experience in a professional context.

Learning outcomes

Learning outcomes	N	A	M	E	O
• To be able to analyze human or managerial issues and to draw conclusions for action	·	✓	·	·	·
• To be able to identify the management style adapted to a situation	✓	·	·	·	·
• To know the main theoretical currents in organization theory	✓	·	·	·	·

Manager : Anouk GREVIN

Marketing and Business Intelligence

Hours

Lect	Tut	PW	Proj	WP	Asst
3	10.5				10.5

Evaluation

One evaluation : *Examen*

Outline

1 - The Marketing approach
From needs to proposals
Place of the Marketing in a company
Evolutions of the Marketing, value creation, ICTS, CRM, one to one ...
2 - The Strategic Marketing
Corporate strategies, strategic diagnostics (swot, Porter, life cycle, BCG ...)
Marketing strategies, segmentation, targeting, positioning, innovation...
MIS, techniques of studies, market study: demand, offers, environment
3. The operational marketing
Marketing Mix, Product, Place, Promotion, Price
4. Conference Economic Intelligence : stakes and main functions of the economic intelligence and methodology of the watch

Goals

Present the approach marketing, heart of the activity of the company, which concerns all the functions of the company, in term of value creation and satisfaction of the needs for the customer. Present the stakes, the strategic aspects and the main operational levers.
Introduction to business intelligence.

Bibliography

G. Armstrong, P Kotler ; « Principes de Marketing » ; Pearson Education - Mercator; "Mercator"; Dunod. Dernières éditions.
Audigier M., Coulon G., Rassat P. : « L'intelligence économique » - Economica

Prerequisites

General knowledge of the company and its functions. Introduction in the economy and the management.

Learning outcomes

Learning outcomes	N	A	M	E	O
• Understand the role and the place of the approach and the function Marketing within the firm.	✓	·	·	·	·
• Join the role, the stakes and the methodologies of the marketing initiative into a professional approach.	✓	·	·	·	·
• Know the main generic strategies of a company allowing it to build a concurentiel long-lasting advantage.	✓	·	·	·	·
• Know the techniques of studies and be able to validate an initiative of simple study.	✓	·	·	·	·
• Know the main operational levers Product, Place, Promotion, Price, in term of means of action, stakes and role.	✓	·	·	·	·

Methodology : Project management 1

Hours

Lect	Tut	PW	Proj	WP	Asst
	8				5

Evaluation

One evaluation : *DS*

Bibliography

- HEAGNEY, Joseph. Fundamentals of project management. Amacom, 2016
- BOURGEOIS, Jean-Paul. Gestion de projet. Ed. Techniques Ingénieur, 1997

Learning outcomes

Learning outcomes	N	A	M	E	O
• TPN-2	✓	·	·	·	·
• TPN-4	·	✓	·	·	·
• TPN-7	✓	·	·	·	·
• TPN-12	✓	·	·	·	·
• TPN-15	✓	·	·	·	·
• TPN-16	✓	·	·	·	·

Manager : John KINGSTON

Methodology : decipher information skills !

Hours

Lect	Tut	PW	Proj	WP	Asst
	16.5				

Evaluation

One evaluation : *DS + CC*

Bibliography

- François-Bernard Huyghe, Fake News, VA press, « Influence et conflits », 2019

Learning outcomes

Learning outcomes	N	A	M	E	O
• TPN-1	·	✓	·	·	·
• TPN-2	·	✓	·	·	·
• TPN-3	·	✓	·	·	·
• TPN-7	✓	·	·	·	·
• TPN-12	✓	·	·	·	·
• TPN-13	✓	·	·	·	·
• TPN-21	·	✓	·	·	·

Manager : Cédric LAIR

Modelling-Web-HCI project

Hours

Lect	Tut	PW	Proj	WP	Asst
	12				30

Evaluation

One evaluation : *Projet*

Presentation

This project is an introduction to the life cycle of a software project. The following points are explored : requirement engineering, design (object oriented), development (object oriented in Java), estimation of effort, planification, team work, validation (test).

The students work in a team of 4 students. Each team has to build a software described by a "customer".

Outline

The 6 phases of the project are:
- client meeting
- requirement
- conception
- module implementation
- integration
- acceptance test

Goals

Introduction to Software engineering
Application Modeling
Java Implementation of an application

Prerequisites

Programming with objects: Java langage
UML
Algorithmic

Learning outcomes

Learning outcomes	N	A	M	E	O
• Be able to get the requirements, even those which are left implied	✓	·	·	·	·
• Produce a design which conforms to the requirements and which allows a source code of good quality	✓	·	·	·	·
• Share the writing of a source code between 3 or more persons	✓	·	·	·	·
• Teamwork : divide some tasks according to the skills of the members of the team	✓	·	·	·	·
• Evaluate the gap between the finished product and the initial need	✓	·	·	·	·
• OOP : build a complete sofwtare using OOP and Java	·	·	✓	·	·

Manager : Marie-Pierre NACHOUKI

Multicriteria Decision Analysis

Hours

Lect	Tut	PW	Proj	WP	Asst
8.75	6				10

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Presentation

Multicriteria decision analysis (MCDA) is a collection of methods within the operational research whose goal is to provide assistance to a decision maker to choose from a set of alternatives or actions described by several often conflicting criteria. A typical example is the problem of choosing an apartment, each apartment is described by its rent, surface, distance to work, etc...

Outline

1. General information on multicriteria decision analysis
   Criterion, Actions, Dominance, Pre-order
   Dominance and satisfaction analysis
   2. Principles methods based on a single criterion
   3. Principles of outranking methods
   Outranking relation
   Electre I
   4. Principles of methods based on distance to an ideal action
   Distance to the ideal, the anti-ideal
   TOPSIS
   5. Links with social choice theory

Goals

The objectives of this course are to understand the basic theoretical principles related to preference modeling and multi-criteria decision support, to study the basic methods for this task, and to implement them in a case study.

Bibliography

Vincke P. ; Multicriteria Decision-Aid ; Wiley, 1992

Roy B., Bouyssou D. ; Aide multicritère à la décision : méthodes et cas ; Economica, 1993

Belton V., Stewart T.J. ; Multiple Criteria Decision Analysis - an integrated approach ; Kluwer Academic Publishers, 2002

Learning outcomes

Learning outcomes	N	A	M	E	O
• Knowing definitions of the following notions : pre-order, criterium, optimum of Pareto	·	·	✓	·	·
• Applying MCDA method based on a single criteron	·	✓	·	·	·
• Applying MCDA method based on outranking	·	✓	·	·	·
• Applying MCDA method based on ideal action	·	✓	·	·	·

Manager : Philippe LERAY

Multimedia

Hours

Lect	Tut	PW	Proj	WP	Asst
12.5	1.5	9			16

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Goals

This topic provides scientific and technical background, both from theory and practice, about processing of audio and visual data.

Prerequisites

Information theory.
Linear algebra
Statistics
Probabilities

Manager : Marc GELGON

Multimedia machine learning and coding

Hours

Lect	Tut	PW	Proj	WP	Asst
16.25	1.5	13.5	9		20

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Prerequisites

Image processing
Information theory

Learning outcomes

Learning outcomes	N	A	M	E	O
• Understand and be able to describe the mechanisms (algorithms, influence of parameters) involve in compressing and transmitting audiovisual documents.	·	·	✓	·	·
• Understand applications, stakes and a few typical data analysis techniques applied to multimedia data, for information retrieval	·	✓	·	·	·
• Understand the stakes and organization of the following documents : patent, standard, scientific paper	✓	·	·	·	·
• Improve capability and understanding of one's mathematical background by having applied it to several multimedia data processing tasks.	·	✓	·	·	·

Manager : Marc GELGON

Natural language processing

Hours

Lect	Tut	PW	Proj	WP	Asst
10	1.5	8.5			8

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Outline

Introduction linguistics Ambiguity Part-of-speech and morphology : word segmentation String searching algorithms Statistical inference : n-gram Models over sparse data Hidden Markov models. Viterbi algortihm Transformatio-base learning of tags Syntactic parsing Programming language:Python Nltk library

Goals

Initiation of Natural language processing dedicated to train language-engineering professionals. The course focus on classical approaches but also empirical and statistical approaches. For each theoritical linguistic dimensions, lexicals and Syntax, we study the stat-of-the art data structures and algorithms.

Bibliography

Foundations of Stastistical Natural Language Processing, Christopher D. Manning et Hinrich Schütze, MIT, 1999. Handbook of Natural Language Processing, Second Edition (Chapman & Hall/Crc: Machine Learning & Pattern Recognition), Nitin Indurkhya and Fred J. Damerau (eds), 2010. Speech and Language Processing (2nd Edition) Daniel Jurafsky. 2008.

Prerequisites

Formal languages and automata Elementary probability theory

Manager : Marc GELGON

Negotiation

Hours

Lect	Tut	PW	Proj	WP	Asst
	6	4.5			10.5

Evaluation

One evaluation : *DS + vidéo*

Outline

1 - Argumentation
2 - Negotiation and management of conflicts
2.1 - Introduction to the system negotiation
2.2 - Strategies of negotiation
2.3 - Technical and tactical of negotiation
2.4 - Main theoretical currents

Goals

Make sensitive the pupils in theories, techniques and stakes in the contemporary management in resituant in a historical perspective. Give them the theoretical and practical bases of the negotiation with various partners of the engineer to advance projects, take out of situations of blocking or manage conflicts.

Bibliography

Stimec A. ; « La négociation » ; Dunod
Fisher, Ury ; « Comment réussir une négociation » ; Seuil

Prerequisites

General knowledge of companies.
Interpersonal communication in companies

Learning outcomes

Learning outcomes	N	A	M	E	O
• Know the theories, the strategies, the tactics and the techniques of negotiation, in particular the reasoned negotiation.	·	✓	·	·	·
• Be able to analyze and prepare a situation of negotiation.	·	✓	·	·	·

Manager : Jacques MOREAU

New interactions

Hours

Lect	Tut	PW	Proj	WP	Asst
5	1.5	6			6

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Manager : Toinon VIGIER

Object-oriented C++ software project

Hours

Lect	Tut	PW	Proj	WP	Asst
3					30

Evaluation

One evaluation : *Projet*

Outline

- Modeling of a problem and creation of algorithmic structures
  - Implementation in C

Goals

Practice modeling and programming in C.

Bibliography

Brian W. Kernighan et Dennis M. Ritchie, Le Langage C

Prerequisites

Algorithmic
  Procedural language C

Learning outcomes

Learning outcomes	N	A	M	E	O
• Modeling a problem in the form of an algorithm	·	·	✓	·	·
• Implementation of algorithms in C language	·	·	✓	·	·

Manager : Fabien PICAROUGNE

Object-oriented design and programming with C++

Hours

Lect	Tut	PW	Proj	WP	Asst
15	2	15			12

Evaluation

One evaluation : *DS*

Outline

- Fundamentals of language
  - From structure to the object
  - Operators
  - C++ program structure
  - Inputs / Outputs
  - Exceptions
  - Inheritance, static/dynamic link
  - Casting
  - Templates
  - Standard library

Goals

The paradigm of the object-oriented programming is essential in any modern programming language. The first objective of this course is to study the mechanisms of the object-oriented programming. The second more particularly relates to the training of the modern C++ language (post C++11) and of its standard library.

Bibliography

- Bjarne Stroustrup, The C++ Programming Language, Addison Wesley Longman edts
  - Scott Meyers. 2014. Effective Modern C++: 42 Specific Ways to Improve Your Use of C++11 and C++14 (1st ed.). O'Reilly Media, Inc.

Prerequisites

- Algorithms
  - C Language
  - Object Modelling

Learning outcomes

Learning outcomes	N	A	M	E	O
• Model a problem with an object oriented approach	·	·	✓	·	·
• Implement an object model in C++	·	·	✓	·	·
• Know how to overload operators	·	·	✓	·	·
• Mastering the mechanism of inheritance in C++	·	·	✓	·	·
• Designing class models	·	✓	·	·	·
• Use the standard library	·	✓	·	·	·

Manager : Fabien PICAROUGNE

Opening courses 2

Hours

Lect	Tut	PW	Proj	WP	Asst
10.5					10.5

Evaluation

One evaluation : *Contrôle continu*

Manager : Chrystèle GONCALVES

Operating systems 2

Hours

Lect	Tut	PW	Proj	WP	Asst
16	1.5	18			17

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Outline

1. Process management: scheduling and execution. Operations. HWP and LWP Process. IPC
2. Process scheduling: mono / multi processors. FCFS scheduling, EFRC, Tourniquet.
3. Memory Management: Mono / multi-programming and memory. Allocation. Virtual memory. Paging and segmentation. Page replacement.
4. Process synchronization Parallelism and competition. Resources and critical section. Semaphores and monitors.
5. Key Issues: Producers-consumers. Readers-writers. philosophers.
6. System Programming: C programming interface of Unix ("Application Programming Interface" API) fork, I/O, ipc, pthreads

Goals

The goal is to understand the advanced software mechanisms (API) of the operating systems for application programming

Bibliography

Tanenbaum A. ; Systèmes d'exploitation systèmes centralisés et systèmes distribués ; InterÉditions, 1994.
Silberschatz A., Galvin P. B. ; Principes des systèmes d'exploitation ; ÉdiScience international, 1988.
Beauquier J., Bérard B. ; Systèmes d'exploitation concepts et algorithmes ; Inter Éditions, 1994

Prerequisites

User commands in unix
C language programming

Learning outcomes

Learning outcomes	N	A	M	E	O
• Understanding of the mechanisms of process management, scheduling and execution.	·	·	✓	·	·
• understanding of the advanced mechanisms of the virtual memory management	·	·	✓	·	·
• Know-how use tools for process synchrinization	·	✓	·	·	·
• Coding with semaphores	·	·	✓	·	·
• Programming synchronizations with monitors	·	·	✓	·	·
• Advanced programming with C API of unix	·	·	✓	·	·

Manager : Fabrice GUILLET

Organization : Business Simulation 1

Hours

Lect	Tut	PW	Proj	WP	Asst
	28				

Evaluation

One evaluation : *Soutenance + CC*

Learning outcomes

Learning outcomes	N	A	M	E	O
• TPN-1	·	✓	·	·	·
• TPN-2	·	✓	·	·	·
• TPN-4	·	✓	·	·	·
• TPN-5	·	✓	·	·	·
• TPN-7	·	✓	·	·	·
• TPN-12	·	✓	·	·	·
• TPN-13	·	✓	·	·	·
• TPN-14	·	✓	·	·	·

Manager : Chrystèle GONCALVES

Organization : understanding organizations

Hours

Lect	Tut	PW	Proj	WP	Asst
	15				6

Evaluation

One evaluation : *DS + étude de cas*

Bibliography

- A. de Baynast, J. Lendrevie, J. Levy - Mercator ; tout le marketing à l'ère digitale ! (Dunod. Dernières éditions)

- F. Canard - Management de la qualité ; vers un management durable (Gualino LExtenso Editions)

- H. Mintzberg - Structure et dynamique des organisations (Éd. d'Organisation)

- M. Crozier - A quoi sert la sociologie des organisations ? (Éd. Seli Arslan)

- S. Robbins, D. DeCenzo, M. Coulter - Management, l'essentiel des concepts et des pratiques (9ème édition) (Ed. Pearson)

Learning outcomes

Learning outcomes	N	A	M	E	O
• CTI-07	✓	·	·	·	·
• TPN-4	✓	·	·	·	·
• TPN-5	✓	·	·	·	·

Manager : Luc OILI

Parallel Computing

Hours

Lect	Tut	PW	Proj	WP	Asst
8.75	1.5	9			16

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Outline

Introduction to parallelism... s

Parallel computers: Architectures with shared memory (Flynn's classification), virtually shared memory and distributed memory

Expressing parallel computations: Data parallelism, task parallelism, and hybrid parallelism

Parallel algorithmics: Work, effective work, Amdhal's law, NC class, optimal and extensible algorithms

"Parallel" optimisations: Techniques for mono- and multi-processors

Goals

We are interested in high performance processing. Dedicated parallel architectures are unavoidable for attaining the highest performances. However, a set of interconnected computers can also achieve high performances, if one knows how to...

Bibliography

Cormen T., Leiserson C., Rivest R. ; Introduction à l'algorithmique ; Dunod

Cosnard M., Trystram D. ; Algorithmes et architectures parallèles ; InterÉditions

Prerequisites

Computer Architectures; Networks and Telecommunications; Algorithmics; C Programming Language

Learning outcomes

Learning outcomes	N	A	M	E	O
• Write down data parallel algorithms	·	·	✓	·	·
• Evaluate the time and surface complexities	·	✓	·	·	·
• Write down parallel recursive algorithms	·	✓	·	·	·
• Parallelise algorithms on multi-core and multi-machine architectures	·	·	✓	·	·

Manager : José MARTINEZ

Parallel architectures and data parallelism

Hours

Lect	Tut	PW	Proj	WP	Asst
2.5	4.5				2

Evaluation

One evaluation : *Théorie*

Outline

Introduction
- Data parallelism, and hybrid parallelism
- Elements of parallel algorithmics

Goals

We are interested in the efficient processing of huge datasets. Data parallelism is the key to success. In practice, one can find it in various functional approaches, including... SQL.

Bibliography

Cormen T., Leiserson C., Rivest R. ; Introduction à l'algorithmique ; Dunod
Cosnard M., Trystram D. ; Algorithmes et architectures parallèles ; InterÉditions

Prerequisites

Algorithmics; C Programming Language

Learning outcomes

Learning outcomes	N	A	M	E	O
• Write down data parallel algorithms	·	·	✓	·	·
• Evaluate the time and surface complexities	·	·	✓	·	·
• Write down parallel recursive algorithms	·	·	✓	·	·

Manager : José MARTINEZ

Person : Physical education and sport 1

Hours

Lect	Tut	PW	Proj	WP	Asst
	19.5				2

Evaluation

One evaluation : *CC*

Learning outcomes

Learning outcomes	N	A	M	E	O
• TPN-3	✓	·	·	·	·
• TPN-7	✓	·	·	·	·
• TPN-12	✓	·	·	·	·
• TPN-19	✓	·	·	·	·

Manager : Jérôme BEZIER

Person : Physical education and sport 2

Hours

Lect	Tut	PW	Proj	WP	Asst
	19.5				2

Evaluation

One evaluation : *DS + CC*

Learning outcomes

Learning outcomes	N	A	M	E	O
• TPN-3	✓	·	·	·	·
• TPN-7	✓	·	·	·	·
• TPN-12	✓	·	·	·	·
• TPN-19	✓	·	·	·	·

Manager : Jérôme BEZIER

Person : interpersonal skills

Hours

Lect	Tut	PW	Proj	WP	Asst
	7.5				7.5

Evaluation

One evaluation : *DS + CC*

Learning outcomes

Learning outcomes	N	A	M	E	O
• TPN-5	✓	·	·	·	·
• TPN-6	✓	·	·	·	·
• TPN-7	✓	·	·	·	·
• TPN-12	✓	·	·	·	·
• TPN-13	✓	·	·	·	·
• TPN-20	✓	·	·	·	·
• TPN-21	✓	·	·	·	·

Manager : Anouk GREVIN

Person : my relation to others

Hours

Lect	Tut	PW	Proj	WP	Asst
	12.5				6

Evaluation

One evaluation : *DS + CR*

Bibliography

Ces contenus empruntent beaucoup de notions de base à des approches comme l'analyse transactionnelle (AT), la communication non-violente (CNV), le life coaching, la programmation neuro-linguistique (PNL).

Pour aller plus loin, on pourra consulter avec profit :

- DE LASSUS René, L'analyse transactionnelle : une méthode révolutionnaire pour bien se connaître et mieux communiquer, Marabout (Savoir pratique n3516), 2013, 288 p., ISBN 2501085493

- DE LASSUS René, La communication efficace par la PNL, Marabout (Bien-être - Psy), 2019, 288 p., ISBN 2501089499

- DE LASSUS René, L'ennéagramme : les 9 types de personnalités, Marabout (Poche Psy n3568), 2019, 288 p., ISBN 2501084950

- DE MONICAULT Frédéric / RAVARD Olivier, 100 questions posées à l'entretien d'embauche, Jeunes Editions (Guides J), 2004 (3e édition), 182 p., ISBN-10 : 2844724221 / ISBN-13 : 978-2844724229

- LEONARD Thomas J., The portable coach, Simon & SCHUSTER, 1999, 336 p., ISBN-10 : 0684850419 / ISBN-13 : 9780684850412

- ROSENBERG Marshall B., Les mots sont des fenêtres (ou bien ce sont des murs) : initiation à la communication non-violente, La Découverte, 2016, 320 p., ISBN 2707188794

- www.16personalities.com

- www.acnv.com

Learning outcomes

Learning outcomes	N	A	M	E	O
• TPN-7	✓	·	·	·	·
• TPN-12	✓	·	·	·	·
• TPN-13	✓	·	·	·	·
• TPN-19	✓	·	·	·	·
• TPN-20	✓	·	·	·	·
• TPN-21	✓	·	·	·	·

Manager : Maud BEAUTRAIS SATTLER

Personal data

Hours

Lect	Tut	PW	Proj	WP	Asst
10	1.5	6			12

Evaluation

One evaluation : *Théorie*

Outline

Recommandation and personnalization : social media, social networks.

Benefits of recommender systems

Object description : collaborative tagging

evaluating

User modelling

Collaborative filtering : user/item knn-based

Factorization and latent structures

Evaluation of recommender systems

How recommender systems relate to neighbouring issues (information retrieval, privacy, social networks)

Goals

This topic presents recommender systems and information personnalization : applicative contexts, data from which recommendation may be built, problem modelling, algorithms.

Bibliography

Ricci et al. Recommender Systems Handbook, Springer 2009. Several tutorial papers are indicated to students, varying from year to year.

Manager : Marc GELGON

Predictive analysis

Hours

Lect	Tut	PW	Proj	WP	Asst
7.5	3	7.5			6

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Outline

Introduction
    Predictive model lifecycle
    Methods and measures for model performance evaluation
    Model selection and hyperparameter tuning
    Resampling methods
    Scoring

Goals

This course focuses on the practical implementation of a predictive machine learning process, and examines the different steps that lead to a "good" model.

Bibliography

Trevor HASTIE, Robert TIBSHIRANI, Jerome. FRIEDMAN - "The Elements of Statistical Learning" - Springer, 2009, 2nd edition

Antoine CORNUEJOLS, Laurent MICLET, Jean-Paul HATON - "Apprentissage artificiel - Concepts et algorithmes" - Eyrolles, 2010, 2e édition

Stéphane TUFFERY - "Data mining et statistique décisionnelle" - Technip, 2010, 3e édition

Prerequisites

Statistical estimation basics
    Notions in data mining and machine learning

Manager : Julien BLANCHARD

Probabilistic reasoning systems

Hours

Lect	Tut	PW	Proj	WP	Asst
10	7.5				15

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Presentation

Knowledge representation and reasoning gave rise to many models. Probabilistic graphical models, specifically Bayesian networks (BN), initiated by Judea Pearl in the 1980s under the name of probabilistic expert systems have proved being useful tools for the representation of uncertain knowledge and reasoning from incomplete information in many fields such as bioinformatics, risk management, marketing, computer security, transportation, etc..

Outline

1. Introduction to Bayesian networks, or "probabilistic expert systems"
   2. Principle of probabilistic reasoning = probabilistic inference
   3. Some algorithms of probabilistic inference
   Message passing, Junction tree
   4. Introduction to Bayesian networks learning
   Construction by expertise (elicitation)
   Learning from data
   5. BN extensions (temporal problems, decision problems, relational data)

Goals

The objectives of this course are to understand the theoretical principles on which probabilistic reasoning systems such as Bayesian networks are based, to see how these models can be built from expertise or data, and to review certain extensions (dynamic, decisional, relational) of Bayesian networks.

Bibliography

Naïm, P., Wuillemin, P.-H., Leray, P., Pourret, O., and Becker, A. ; Réseaux bayésiens ; Eyrolles, 2004

Pearl, J. ; Probabilistic Reasoning in Intelligent Systems : Networks of Plausible Inference ; Morgan Kaufmann, 1988

Pearl, J. ; Causality : Models, Reasoning, and Inference ; Cambridge University Press, 2000

Prerequisites

Notions of probability and statistics

Learning outcomes

Learning outcomes	N	A	M	E	O
• Knowing notions of probabilistic reasoning, conditional independance, d-separation	·	·	·	✓	·
• Build a BN from expertise	·	·	✓	·	·
• Knowing principles of probabilistic inference algorithms	·	·	✓	·	·
• Knowing principles of BN learning algorithms	✓	·	·	·	·
• Knowing principles of some BN extensions (dynamic, decision, relational BN)	✓	·	·	·	·

Manager : Philippe LERAY

Probability

Hours

Lect	Tut	PW	Proj	WP	Asst
12.5	7.5				12

Evaluation

One evaluation : *Théorie*

Outline

Introduction
- Basic notions
- Probabilities
- Random variables
- Common probability distributions
- Theorems
- Random couples

Goals

To study the basic concepts of probability theory to model and solve real or theoretical problems.

Bibliography

Ross S. M. ; « Introduction to probability models » ; Academic Press, 2009, 10e édition
Saporta G. ; « Probabilités, analyse des données et statistique » ; Technip, 2006, 2e édition
Bogaert P. ; « Probabilités pour scientifiques et ingénieurs » ; De Boeck, 2006

Manager : Julien BLANCHARD

Problem modelling and combinatorial optimization

Hours

Lect	Tut	PW	Proj	WP	Asst
11.25	1.5				8

Evaluation

One evaluation : *Théorie*

Outline

1- Introduction
2- Linear programming on a illustration
3- Fitness landscapes and local strategies
4- Genetic algorithms
5- Simulated annealing
6- Ant algorithms

Goals

Introduction to NP- hard problems (travelling salesman problem, graph coloration, ..). Initiation to combinatorial optimization and metaheuristics.

Bibliography

Charon I. Germa A., Hudry O. (1996). Méthodes d'optimisation combinatoires, Masson Cook W.J., Cunningham W.H., Pulleybanck W.H., Schrijver A. (1998). Combinatorial optimization, Wiley
Teghem J., Pirlot M. (2002). Optimisation approchée en recherche opérationnelle, Lavoisier

Prerequisites

Graph theory

Manager : Pascale KUNTZ-COSPEREC

Professional English 3

Hours

Lect	Tut	PW	Proj	WP	Asst
	19	2			

Evaluation

3 evaluations :

- *CC*
- *Tutorat*
- *DS*

Professional Project 2 : professional project presentation

Hours

Lect	Tut	PW	Proj	WP	Asst
			13.5		2.5

Evaluation

One evaluation : *Contrôle continu*

Outline

Path : 4 sessions of 3h TD

1 / Portfolio "Exploration Project Professional" : my "professionnel journey" those last years - changes - choices - motivations...

2 / My professionnal project : what I intended, the way to go, anticipate steps (especially the choice of option at the end of the fourth year)

3 and 4 / I introduce myself, my skills, my project : simulations and role plays

Goals

Clarify the professional project and be able to present it orally in different circumstances (professional network meetings, hiring individual or collective interview , student lounge, video resume, ..)

Bibliography

"Le Carnet de Route universitaire et professionnel" - SUIO de l'Université de Nantes - 2008

Prerequisites

Professionnal project 1 (S5)

Discovery of firms and professions (S6)

Learning outcomes

Learning outcomes	N	A	M	E	O
• Formalize and build their own professional project	·	·	✓	·	·
• Present themselves professionally : introduction, skills, project	·	✓	·	·	·
• Updated Resume	·	✓	·	·	·

Manager : Maud BEAUTRAIS SATTLER

Professional project 3 : skills passport

Hours

Lect	Tut	PW	Proj	WP	Asst
			12		3

Evaluation

One evaluation : *Examen*

Outline

1 / Day skills (7.5 h TD)

Course within six thematic workshops (12 to 15 students maximum) in connection with the assessment of skills and seeking their first job.

Production of a paper on key competencies.

2 / Job interview simulation platform (3h TD)

Job Interviews for the last training (speed dating) with business partners Polytech'Nantes

Goals

Achieve an end-of course student appraisal to help the student:

- To find an internship study linked with his professional project
- To stand in front of a future recruiter with realism about his skills.

Bibliography

"Le Carnet de Route universitaire et professionnel" - SUIO de l'Université de Nantes - 2008

Prerequisites

Professionnal Project 2 : Professional project presentation

Learning outcomes

Learning outcomes	N	A	M	E	O
• Produce a skill assessment	·	✓	·	·	·
• Present themselves professionally: introduction, skills, project	·	·	✓	·	·

Manager : Maud BEAUTRAIS SATTLER

Project management

Hours

Lect	Tut	PW	Proj	WP	Asst
	10.5				10.5

Evaluation

One evaluation : *Examen*

Outline

1 / Introduction:
Project Definition - Project Management - Specifications of a project - Project Types
2 / Stakeholders:
Instances of project, categories of actors, roles and borders - gourvernance project - the project leader missions
3 / The project life cycle
The phasing of the project and its steps (the emergence - set up - implementation - evaluation)
For each phase: objectives, operations, deliverables, tools
4 / Methods and tools of project management (with exercises)
Block diagram, work and responsibilities - Project Planning and Resource Management - Project Dashboard - Risk Management (FMEA)
5 / Communication and changes management (Basic)
Communication Plan - Impact analysis and changes management sheet

Goals

Provide basic knowledge of project management allowing students to understand the different types of projects, stakeholders and bodies, project methodology (phasing, decisions, methods and tools) in order to prepare them to take responsibility in a simple project or to contribute to the creation of a more complex project (internship and / or transversal project and / or student project)

Bibliography

Le dictionnaire de management de projet - AFITEP (5e édition), AFNOR ,Paris, impr 2010
La conduite de projet, Hugues Marchat, Editions d'Organisation, Paris, juillet 2008
Le Kit du Chef de projet, Hugues Marchat, Livres outils - Editions d'organisation, Paris, 2010

Learning outcomes

Learning outcomes	N	A	M	E	O
• Know and apply the methods and tools of traditional project management, understand their context of use, their advantages and limitations	·	✓	·	·	·
• Plan a mission according to project method : distinguish purpose / objectives / means, plan action, anticipate major risks, evaluate the outputs.	·	✓	·	·	·
• Identify stakeholders in a project and understand their respective roles towards the project.	·	✓	·	·	·
• Pilot a project = know the responsibilities of a project leader	✓	·	·	·	·

Manager : John KINGSTON

Project management 1

Hours

Lect	Tut	PW	Proj	WP	Asst
4	4.5				

Evaluation

2 evaluations :

- *Pratique*
- *Théorie*

Outline

- Goals and activities of software engineering
  - requirement analysis
  - estimation and planning
  - agile methods

Goals

Methods and technique for project management, in particular for software engineering. This lecture deals with the different steps of projects and different types of lifecycles. This lecture can be applied in the Entreprise-drive Project.

Prerequisites

- software development

Manager : Yannick PRIE

Quality approach and problem solving

Hours

Lect	Tut	PW	Proj	WP	Asst
	10.5				10.5

Evaluation

One evaluation : *Contrôle continu*

Outline

1 / Origins and forms of quality management:
Product quality - Quality system - quality project - management systems - ISO 9001 - process approach - opening trades on standards
2 / Principles of organization based on the process approach:
Typology of processes - Mapping - Organizational Interfaces
3 / approach and tools useful to the engineer:
QQOQCP - 5M - Flowchart - Methods of analysis and problem solving
4 / What is he an engineer involved in a quality approach?
Decollaboration direct objects with a quality manager - topics that relate directly to the engineer

Goals

- Open to students issues, forms and tools of quality management
- Know the "commun" tools quality approach
- Encourage collaboration among future engineers and quality managers who hire entrerprises

Bibliography

"Maîtriser les processus de l'entrerpise - Guide opérationnel" - Michel CATTAN, Nathalie IDRISSI, Patrick KNOCKAERT, 3 édition, Editions d'Organisation

"Méthodes et outils pour résoudre un problème" 45 outils pour améliorer la performance de votre organisation - Alain-Michel CHAUVET, 3 édition, DUNOD

Prerequisites

- Discover the world of entrerpise through an internship and / or project
- Ability to project in the engineering profession
(see Module Discovery trades and entrerpise 3rd year)

Learning outcomes

Learning outcomes	N	A	M	E	O
• Understand the organization of a company in a point of view "process"	✓	·	·	·	·
• Handle "commun" tools quality through analysis and problem solving	·	✓	·	·	·
• Know the principles of continuous improvement	✓	·	·	·	·

Manager : Cédric LAIR

R&D project for students working in a company

Hours

Lect	Tut	PW	Proj	WP	Asst
			120		

Evaluation

One evaluation : *Note PRED*

Goals

The R&D project allows students to discover new requirements and constraints that are unrelated to "standard" applications but understand and take advantage of the state-of-the-art . Without being competitive with a Master of research curriculum, this project aims at providing a glimpse of the creative industrial work either in a R&D department of a big company or in an innovative start-up.

Learning outcomes

Learning outcomes	N	A	M	E	O
• Conduct a scientific state-of-the-art	·	✓	·	·	·
• Devise innovative solutions	·	✓	·	·	·
• Prove the validity of the chosen solution	·	·	✓	·	·
• Evaluate one's own proposals and open new research issues	·	✓	·	·	·

Manager : José MARTINEZ

Relational Database Management Systems

Hours

Lect	Tut	PW	Proj	WP	Asst
13.75	12	6			17

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Outline

Course Introduction
- Object appoach
- Use Case Diagram
- Class Diagram
- Object Diagram, Package Diagram
- Sequence and Communication Diagram
- State machine Diagram
- Activity Diagram
- Component Diagram, Deployment Diagram
- Introduction to OCL
- Conclusion

Goals

This course focuses on learning the concepts and notation of UML modeling language and discusses when to apply which diagram in software development process.

Bibliography

G Booch Conception orientée objet et applications Addison-Wesley, 1992
P-A MullerModélisation objet avec UMLEyrolles, 1997
I Jacobson, G Booch, J Rumbaugh UML en action Addison Wesley 1999
Alistair Cockburn Rédiger des cas d'utilisation e caces [« Writing e ective use cases »]
Eyrolles, 1999 (ISBN 2212092881)
Laurent Audibert UML 2 - de l'apprentissage à la pratique. Ellipse 2009

Manager : Marie-Pierre NACHOUKI

Relational data model

Hours

Lect	Tut	PW	Proj	WP	Asst
20	12	6			27

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Outline

Relational model: bases
Relational model: Fonctional dependencies
Relational model: Normal forms
Relational model: Relational algebra
Relational model: Futher dependencies
Relational model: Algorithms for relational database design
Relational model: SQL language
Relational model: PL/SQL language
Relational model: : Procédures, functions, packages and triggers
Relational model: Data dictionnary and database authorization

Goals

This course presents an introduction to the modelling through the relational model.The presented concepts are illustrated and implemented through the DBMS Oracle.

Bibliography

Escoffier B., Pagès J. ; Initiation aux traitements statistiques ; Presses universitaires de Rennes, 1997

Rouanet H., Le Roux B., Bert M.-C. ; Statistique en sciences humaines : procédures naturelles ; Dunod, 1987

Tassi P. ; Méthodes statistiques ; Economica, 1985

Saporta G. ; Probabilités, analyse des données et statistique ; Éditions Technip, 1996

Learning outcomes

Learning outcomes	N	A	M	E	O
• Model a data-driven real-world problem	·	✓	·	·	·

Manager : Marie-Pierre NACHOUKI

Research and Development Project

Hours

Lect	Tut	PW	Proj	WP	Asst
			150		30

Evaluation

One evaluation : *Pratique*

Goals

The R&D project allows students to discover new requirements and constraints that are unrelated to "standard" applications but understand and take advantage of the state-of-the-art . Without being competitive with a Master of research curriculum, this project aims at providing a glimpse of the creative industrial work either in a R&D department of a big company or in an innovative start-up.

Learning outcomes

Learning outcomes	N	A	M	E	O
• Conduct a scientific state-of-the-art	·	✓	·	·	·
• Devise innovative solutions	·	✓	·	·	·
• Prove the validity of the chosen solution	·	·	✓	·	·
• Evaluate one's own proposals and open new research issues	·	✓	·	·	·

Manager : José MARTINEZ

Safety Health at Work

Hours

Lect	Tut	PW	Proj	WP	Asst
	10.5				5

Evaluation

One evaluation : *Contrôle continu*

Outline

General information on occupational risks (defined AT / MP / risks / hazards, pricing, direct and indirect costs, statistics, internal and external actors)

Regulatory framework Law 1991 - prevention principles, guidelines, laws, decrees,

Penal and civil responsibility: roles and responsibilities of an engineer in the prevention of occupational risks, delegation of power

Different hazards and their sources in company

Evaluation of occupational hazards applied to a work situation, risks document

Definition and implementation of preventive and / or corrective actions

Work accident : mecanisms, analysis

Bibliography

www.inrs.fr

sites des carsat

www.legifrance.gouv.fr

code permanent hygiène et sécurité

http://www.travailler-mieux.gouv.fr/

Learning outcomes

Learning outcomes	N	A	M	E	O
• Know their rights and obligations under the internship and future employment	·	✓	·	·	·
• Identify the risks of infringement with the health on a workstation and propose adapted prevention measures	·	✓	·	·	·
• Know the regulations relative to the hygiene and the safety at work	✓	·	·	·	·
• Prepare the student to think of an issue of health and safety at work to apprehend in its future projects	·	✓	·	·	·

Manager : Cédric LAIR

Second foreign language - Chinese

Hours

Lect	Tut	PW	Proj	WP	Asst
	18				

Evaluation

One evaluation : *CC*

Second foreign language - Chinese

Hours

Lect	Tut	PW	Proj	WP	Asst
	18				

Evaluation

One evaluation : *CC*

Second foreign language - German

Hours

Lect	Tut	PW	Proj	WP	Asst
	18				

Evaluation

One evaluation : *CC*

Second foreign language - German

Hours

Lect	Tut	PW	Proj	WP	Asst
	18				

Evaluation

One evaluation : *CC*

Second foreign language - Japanese

Hours

Lect	Tut	PW	Proj	WP	Asst
	18				

Evaluation

One evaluation : *CC*

Second foreign language - Japanese

Hours

Lect	Tut	PW	Proj	WP	Asst
	18				

Evaluation

One evaluation : *CC*

Second foreign language - Spanish

Hours

Lect	Tut	PW	Proj	WP	Asst
	18				

Evaluation

One evaluation : *CC*

Second foreign language - Spanish

Hours

Lect	Tut	PW	Proj	WP	Asst
	18				

Evaluation

One evaluation : *CC*

Security of Systems and Networks

Hours

Lect	Tut	PW	Proj	WP	Asst
7.5	1.5	11			6

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Outline

Introduction: why worry about security? Network Security / system, define what should be protected, security policy

Risks: risks classification, computer programs and their users, the risks of the networks, viruses and worms

Help for the security: security monitoring, hypervision

Filtering and encapsulation of IP packets

Relay / encapsulation / filtering sessions or applications

Goals

Managing risks when deploying computer and network systems

Bibliography

Eric Charton, « Hacker's Guide », Pearson, 2011

Anne Lupfer, « Gestion des risques en sécurité de l'information », Eyrolles, 2010

William Stallings, « Sécurité des réseaux : applications et standards », Vuibert, 2002

Laurent Bloch, Christophe Wolfhugel, « Sécurité informatique : Principes et méthodes à l'usage des DSI, RSSI et administrateurs », Eyrolles, 2011

Prerequisites

Good knowledge on network and systems

Manager : Rémi LEHN

Security policies

Hours

Lect	Tut	PW	Proj	WP	Asst
15	1				6

Evaluation

One evaluation : *Théorie*

Semantic web

Hours

Lect	Tut	PW	Proj	WP	Asst
6	6.5	7.5			9

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Outline

1. introduction

2. Semantic Web: Foundations and challenges. Panorama of languages ??and tools

3. RDF Concepts: Origins of RDF (WWW, XML), motivations, and goals. Metadata descriptions. Terms and predicates. Metadata languages ??(eg Dublin Core Metadata) notations (XML Schema / Notation). Modeling (entity-relationship diagrams, semantic networks, conceptual graphs). Sharing concepts. Vocabulary definition (RDF / S). Syntax, domain terms and relationships. Predefined vocabulary (classes, typing ...). Equivalences between RDF / S and UML.

4. Ontologies and OWL: Defining classes and inferential properties (OWL)

Syntax, definition of inferential properties. Definition of ontologies. Modeling ontologies. Analogies modeling (static) objects.

5. Querying and inference: Exploitation of RDF Web directories, search engines. Querying. XQuery. RQL query descriptions. Inferences (RIL. ..).

7. applications

Analogies with systems based on conventional knowledge (Prolog)

Example: Protégé

Goals

The objective is to present the concepts, language and tools of the Semantic Web. Together, they allow:

to formalize vocabularies and property descriptions;

to create ontologies from these vocabularies;

to process the representations: queries, search for resources and inferences.

Bibliography

Hjelm J. ; Creating the Semantic Web with RDF ; Wiley, 2001

Web Services Essentials ; O'Reilly, 2002, ISBN : 0-596-00224-6

Prerequisites

Ontology modeling

XML language

Prolog

Manager : Fabrice GUILLET

Signal processing

Hours

Lect	Tut	PW	Proj	WP	Asst
8.75	9	9			22.25

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Outline

Lectures introduce theoritical fundations, Exercises and labs follows a more illustrative and qualitative approach.

Lecture: signal categories, signal processing stakes, applications, Invariant Linear System, convolution
signal representation: decomposition, fourier transform
sampling: shannon theorem, spectral analysis

Exercises: convolution, linear filtering, sampling, Discrete fourier Transform, over sampling, sub band analysis

labs: introduction to Matlab, sampling, 1D signal linear filtering, 1D signal spectral analysis, 2D signal spectral analysis, introduction to 2D signal filtering

Goals

This first signal processing course presents the minimal concepts to understand mainly digital signal processing. The course should help the students to start in good conditions following multimedia courses. Student should quickly use intuitive thinking without depoying long and complex calculutus.

Prerequisites

Course in Mathematics for Engineer

Manager : Vincent RICORDEL

Society : Socio-economic debating

Hours

Lect	Tut	PW	Proj	WP	Asst
	12				12

Evaluation

One evaluation : *DS + exposé débat*

Bibliography

- BRAQUET Laurent et MOUREY David, Comprendre les fondamentaux de l'économie, De Boeck, 2015, 475 p., ISBN 978-2-8041-9021-7

- BIASUTTI Jean-Pierre et BRAQUET Laurent, Les débats économiques d'aujourd'hui, Ellipses, 2019, 278p, ISBN 9782340-031210

- DESCAMPS Christian, L'analyse économique en questions, Vuibert, 2005, ISBN 2-71117-7413-9

- SINAÏ Agnès, Penser la décroissance, Sciences Po Les presses, 2018, 210 p, ISBN 9782724613001

- SINAÏ Agnès, Economie de l'après-croissance, Sciences Po Les presses, 2018, ISBN 9782724617559

- PIKETTY Thomas, Capital et idéologie, Seuil, 2019, ISBN 978-2-02-133804-1

- COHEN Daniel, Le monde est clos et le désir infini, Albin Michel, 2015, ISBN 978-2226240293

Learning outcomes

Learning outcomes	N	A	M	E	O
• TPN-1	·	✓	·	·	·
• TPN-2	·	✓	·	·	·
• TPN-3	·	✓	·	·	·
• TPN-8	✓	·	·	·	·
• TPN-9	✓	·	·	·	·
• TPN-10	·	✓	·	·	·
• TPN-11	✓	·	·	·	·

Manager : Chrystèle GONCALVES

Society : history of organizations and epistemology

Hours

Lect	Tut	PW	Proj	WP	Asst
	15				3

Evaluation

One evaluation : *DS + CR*

Bibliography

- Henry Mintzberg, 1982, Structure et dynamique des organisations (Éd. D'Organisation)

- Jean-Charles Asselain, 2007, Histoire des entreprises et approches globales. Quelles convergences ? Dans Revue économique 2007/1 (Vol. 58), pages 153 à 172

- Thomas Piketty, 2013, Le Capital au XXIe siècle, Le Seuil, coll. « Les Livres du nouveau monde », 5 septembre 2013, 976 p.

- Marlyse Pouchol, 2006, La pensée de l'économie chez Galbraith, Innovations, (n23), pp 9 à 30.

Learning outcomes

Learning outcomes	N	A	M	E	O
• CTI-07	✓	·	·	·	·
• TPN-5	✓	·	·	·	·
• CTI-10	✓	·	·	·	·
• TPN-10	✓	·	·	·	·

Manager : Marc BIDAN

Sociology of innovation

Hours

Lect	Tut	PW	Proj	WP	Asst
4.5					4.5

Evaluation

One evaluation : *CR écrit*

Outline

Innovation (organization, development, industrial property, project's driving (steering).

Goals

Global definition "Innovation". Acquire knoledges : the innovation global process. Create a project (non-existant product) (team)

Bibliography

Créativité et Innovation Tayeb Louafa et Francis-Luc Perret (éditions presse polytechniques et universitaires romandes).

La boîte à outils de l'innovation de Géraldine Benoit-Vervantes (éditions Dunod).

Prerequisites

None

Learning outcomes

Learning outcomes	N	A	M	E	O
• Being able to organise and lead an innovation global process	✓	·	·	·	·

Manager : Dominique PECAUD

Software design patterns

Hours

Lect	Tut	PW	Proj	WP	Asst
10	7.5	13.5			20

Evaluation

One evaluation : *Pratique*

Outline

1. Introduction to design pattern
   2. Behavioral pattern
   3. Structural pattern
   4. Creational pattern

Goals

To know an object programming language do not imply to know how to correctly implement a program. It is also necessary to provide a maintenable and upgradable modelling. Design pattern aims to provide elegant modelling solutions for common problems.

The goals are :

- Discover the design patterns
- Implementation of some patterns
- Improve the modelling skills in object programming

Bibliography

Design patterns, Eric Freeman, Editeur : O'Reilly Editions (22 septembre 2005)

Design Patterns: Elements of Reusable Object-Oriented Software, Erich Gamma, , Richard Helm, Ralph Johnson, John Vlissides, Addison-Wesley professional computing series

Prerequisites

Basic Software Engineering

Object programming

UML

Learning outcomes

Learning outcomes	N	A	M	E	O
• Implement some complex design pattern	·	✓	·	·	·
• Understand complex modelling	·	·	✓	·	·

Manager : Antoine PIGEAU

Software testing, integration and delivery

Hours

Lect	Tut	PW	Proj	WP	Asst
3	1.5	3			

Evaluation

One evaluation : *théorie*

Manager : Marc GELGON

Spatial and temporal databases

Hours

Lect	Tut	PW	Proj	WP	Asst
7.5	1	6			6

Evaluation

One evaluation : *Théorie*

Sport 3

Hours

Lect	Tut	PW	Proj	WP	Asst
	19.5				2

Evaluation

One evaluation : *Contrôle continu*

Learning outcomes

Learning outcomes	N	A	M	E	O
• Capacité à prendre des initiatives, mise en action, adaptation à un contexte et/ou consigne (dans un contexte nouveau)	·	·	✓	·	·
• Favoriser l'équilbre physique et psychique des élèves	·	·	✓	·	·
• Etre capable de travailler en équipe, de communiquer et d'établir des relations de confiance et d'entraide	·	✓	·	·	·
• Résister au stress et évacuer les tensions liées aux études	·	·	✓	·	·

Manager : Jérôme BEZIER

Sport 4

Hours

Lect	Tut	PW	Proj	WP	Asst
	19.5				2

Evaluation

One evaluation : *Contrôle continu*

Learning outcomes

Learning outcomes	N	A	M	E	O
• Capacité à prendre des initiatives, mise en action, adaptation à un contexte et/ou consigne (dans un contexte nouveau)	·	·	✓	·	·
• Favoriser l'équilbre physique et psychique des élèves	·	·	✓	·	·
• Etre capable de travailler en équipe, de communiquer et d'établir des relations de confiance et d'entraide	·	✓	·	·	·
• Résister au stress et évacuer les tensions liées aux études	·	·	✓	·	·

Manager : Jérôme BEZIER

Statistical Processing of Information 2

Hours

Lect	Tut	PW	Proj	WP	Asst
12.5	1.5	10.5			10

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Presentation

To use exploratory and inferential statistics methods:
- To deepen the concepts and methods for estimation and hypothesis tests.
- To study the concepts and methods for bidimensional data analysis.
- To study simple and multiple linear regression.
- To put knowledge into practice via practical sessions with the statistical program R.

Outline

Estimation and hypothesis tests
Unidimensional data analysis
Bidimensional data analysis
Introduction to simple and multiple linear regression

Goals

To carry out a basic statistical analysis on a dataset in order to extract main tendencies, identify spurious phenomena, and model relations between numerical variables.

Bibliography

Gilbert SAPORTA - "Probabilités, analyse des données et statistique" - Technip, 2006, 2e édition
Patrick BOGAERT - "Probabilités pour scientifiques et ingénieurs" - De Boeck, 2005
Gaël MILLOT - "Comprendre et réaliser les tests statistiques à l'aide de R" - De Boeck, 2009

Prerequisites

Notions in probability theory.

Manager : Julien BLANCHARD

Statistical processing of information 1

Hours

Lect	Tut	PW	Proj	WP	Asst
13.75	10.5				28.75

Evaluation

One evaluation : *Théorie*

Learning outcomes

Learning outcomes	N	A	M	E	O
• c1	✓	·	·	·	·
• c2	·	✓	·	·	·
• c3	·	·	✓	·	·

Manager : Pascale KUNTZ-COSPEREC

Structured documents and NoSQL

Hours

Lect	Tut	PW	Proj	WP	Asst
8.75	1.5	9			8

Evaluation

One evaluation : *Théorie*

Presentation

The course presents recent trends in storage systems, from both data models, architectures and query facilities point of views. We especially focus on large scale storage systems based on sharding techniques and eventual consistency. The second track deals with several extensions of the relational model among which trees, graphs and objects as basic data structures in the storage system. By the way, we carrefully study query languages and systems dedicated to those new storage systems.

Outline

1. Tree models and XML-relational mapping - inlining and nested sets
2. Nested relations - NF2, eNF2, PNF
3. Objects and graphes - Object-Relational Mapping
4. Overview of the NoSQL galaxy - CAP, BASE, MapReduce
5. Foundations of NoSQL - DHT, 2PC, Vector Clocks
6. Case study

Goals

At the end of the course, students will be able to understand complexity and variety of modern storage systems, to guide design choices to meet storage and query requirements of a given problem, and to set up an architecture to process massively distributed data.

Bibliography

H. Garcia-Molina, J.D. Ullman and J. Widom. "Database Systems - The Complete Book" Prentice-Hall, 2008, 2nd edition

S. Abiteboul, R. Hull and V. Vianu "Foundations of Databases" Addison-Wesley, 1995

S. Abiteboul, I. Manolescu, P. Rigaux, M.-C. Rousset, P. Senellart. "Web Data Management" Cambridge University Press, 2011

Prerequisites

Relational Model

Implementation of Databases

Architecture of Databases

Logic

XML Technologies

Manager : Guillaume RASCHIA

System and cloud administration

Hours

Lect	Tut	PW	Proj	WP	Asst
3		12			13

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Presentation

Administration of Windows et Unix operating systems
Initiation to Openstack

Outline

Windows System Administration : workstations and servers
Unix system administration (evaluation of the desktop)
Openstack

Goals

Autonomous exploitation of Unix and Windows operating systems.
Good administration of my computer in D012 (network labs room).

Prerequisites

Unix and Windows systems usage.

Learning outcomes

Learning outcomes	N	A	M	E	O
• Linux Operating system upgrade	·	·	·	✓	·
• Partition management of a machine	·	·	·	✓	·
• Users management	·	·	·	✓	·
• Advanced administration (Openstack framework)	·	✓	·	·	·

Manager : Rémi LEHN

Textual information retrieval

Hours

Lect	Tut	PW	Proj	WP	Asst
8.5	6.25	9			10

Evaluation

One evaluation : *Théorie*

Outline

Introduction: Short history, definitions and principles, efficacity measures
Conceptual Models: Booleans, vectorials, and probabilistic models
Text Indexing: Statistical and manual indexing

Goals

Information Retrieval is mostly used for text retrieval, under various environments, and most visibly on the Web.

Introducing the querying models as well as the tools and techniques to index texts allows one to understand the limitations of the models, hence to better use them, and possibly to adapt a given system to a domain specific need.

Bibliography

Baëza-Yates R., Ribeiro-Neto B. (Ed.) ; Modern Information Retrieval ; Addison Wesley Longman

Prerequisites

Data Modelling and Data Structures; Notions of Logic, Probabilities and Vectorial Calculus; Algorithmics; Text and Multimedia Data Processing

Manager : José MARTINEZ

Tools for Software Development

Hours

Lect	Tut	PW	Proj	WP	Asst
2.5		8			0.5

Evaluation

One evaluation : *Pratique*

Outline

Lecture : Foudations of program analysis
- Practical work 1 : Static analysis
- Practical work 2 : proof of correctness and termination
- Practical work 3 : management of dependancies and build rules
- Practical work 4 : management of versions.

Goals

Software development takes place in a tool ecosystem with different purposes : managing the build of the system, managing its quality, managing the simultaneous edition of its source code, managing the evolutions of its source code, etc.

The goal of this course is to undersand the principles of some of these tools and to be able to configure and use them.

Prerequisites

Imperative programming (C)

Learning outcomes

Learning outcomes	N	A	M	E	O
• Use a static analysis tool to detect common problems in source code.	·	✓	·	·	·
• Prove that a program is correct with respect to its specification.	·	✓	·	·	·
• Prove that a program terminates (loops, recursion).	·	✓	·	·	·
• Configure a build system (Gnu Make)	·	✓	·	·	·
• Configure a version control system (SVN or GIT)	·	✓	·	·	·
• Know good and bad practices with version control systems.	✓	·	·	·	·

Manager : Julien COHEN

Training for Toeic

Hours

Lect	Tut	PW	Proj	WP	Asst
	18				

Evaluation

One evaluation : *CC*

Transaction processing

Hours

Lect	Tut	PW	Proj	WP	Asst
11.25	4	3			19

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Presentation

This course gives an overview of a fundamental building block of relational database management systems, that is concurrency control and failure recovery mechanisms. Those are key elements of the DBMS that guarantee consistency and reliability.

Outline

ACID properties - Serialisability - Locking Protocols - Alternative Protocols - Distributed Transactions - Logs and Failure Recovery

Goals

Following on the database systems track of knowledge, we study here transaction management. The main purposes are to:

- understand requirements and solutions for preserving data consistency during concurrent write operations;
- practice those ideas in SQL
- control the degree of consistency vs. performance that is well-fitted to a given problem
- understand mechanisms of failure recovery

Bibliography

H. Garcia-Molina, J. Ullman, J. Widom. "Database Systems : The Complete Book" Prentice Hall, 2008, (2nd edition)

A. Silberschatz, H. F. Korth, S. Sudarshan. "Database System Concepts" Mc Graw Hill, 2010, (6th ed)

Prerequisites

Relational Model

Architectures of Database Systems

Manager : Guillaume RASCHIA

Virtualization

Hours

Lect	Tut	PW	Proj	WP	Asst
2.5	1	6			4

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Outline

Introduction
- Userland kernel
- Application isolation
- Machine emulation
- Hypervisors

Goals

Designing virtualized services and deploying virtual machines

Bibliography

Soufiane Rouibia, « Environnements virtuels », support de cours

Prerequisites

Good practice of operating systems

Manager : Rémi LEHN

Web Technologies

Hours

Lect	Tut	PW	Proj	WP	Asst
18.75	1.5	12			8

Evaluation

2 evaluations :

- *Théorie*
- *Pratique*

Manager : Rémi LEHN

Web semantic application and experiences

Hours

Lect	Tut	PW	Proj	WP	Asst
1.25	3	9			11

Evaluation

One evaluation : *projet*

Web services and interoperability

Hours

Lect	Tut	PW	Proj	WP	Asst
10	1	3			6

Evaluation

One evaluation : *Théorie*

Outline

Introduction
- Information system definition
- Integration service roles

Goals

Urbanization consists to organize the progressive and continue evolutions of the information system in order to simplify it, to optimize its performance, and to improve its reactivity and flexibility in relation to the business strategy of the enterprise, while relying on the available technologies on the market.?. The goal of this class is then to present an architecture enterprise process with its associated tools.

The goals are:
- the modelling of the system architecture
- the application interoperability methods

Bibliography

Intégration Applicative EAI, B2B, BPM et SOA, Bernard Manouvrier, Laurent Ménard, Hermès 2007

Urbanisation de BPM, Yves Caseau, DUNOD, 2006

Urbanisation et modernisation du SI, Bernard Le Roux, LucDesbertrand, Pascal Guerif et Xavier Tang, Hermès 2004

Le projet d'urbanisation du S.I., Christophe Longépé

Le système d'information transverse, François Rivard, Georges Abou Harb, Philippe Meret

BPM Business Process Management, Bernard Debauche, Patrick Mégard

Prerequisites

Software engineer
- Application development

Manager : Antoine PIGEAU

Work analysis

Hours

Lect	Tut	PW	Proj	WP	Asst
	12				4

Evaluation

One evaluation : *Contrôle continu*

Bibliography

Cf liste des ressources mises à disposition des étudiants pour répondre aux questions, entre autre :

- J'ai très mal au travail - Christophe Desjours - Octobre 2011 (Interviews Youtube)
- Management Humain, Taskin L. et Dietrich A., De Boeck Supérieur, 2016
- L'évaluation du travail à l'épreuve du réel : critique des fondements de l'évaluation, 1995
- L'acteur et le système, Michel Crozier, Erhard Friedberg, Points (dernière édition 2014)

Learning outcomes

Learning outcomes	N	A	M	E	O
• 1	·	✓	·	·	·
• 2	·	✓	·	·	·

Manager : Anouk GREVIN

conversational agents

Hours

Lect	Tut	PW	Proj	WP	Asst
5	1.5	4.5			6

Evaluation

One evaluation : *Théorie*

Manager : Guillaume RASCHIA

iCreate : Interdisciplinarity, CREAtion, TEchnology

Hours

Lect	Tut	PW	Proj	WP	Asst
			23		27

Evaluation

3 evaluations :

- *Présentation*
- *Rapport de projet*
- *Rendu du code*

Outline

Coming soon...

Prerequisites

- XML and web technologies
  - Programming
  - Image and signal processing
  - Human Computer Interaction
  - Project management

Learning outcomes

Learning outcomes	N	A	M	E	O
• Multimedia data processing	·	✓	·	·	·
• Human computer interaction	·	✓	·	·	·
• Project management	·	✓	·	·	·
• Graphic and space design	✓	·	·	·	·
• Communication / collaboration with other disciplines	·	✓	·	·	·

Manager : Matthieu PERREIRA DA SILVA