

Année universitaire 2026/2027

Data-Driven Decisions and Digital Economics - 2ème année de Master

Responsable pédagogique : RENE AID - <https://dauphine.psl.eu/recherche/cvtheque/aid-rene>

Crédits ECTS : 60

LES OBJECTIFS DE LA FORMATION

Le parcours Data-Driven Decisions and Digital Economics (D4E) a pour objectif de former des économistes capables d'analyser des ensembles de données massives et complexes, notamment pour répondre aux enjeux spécifiques des marchés numériques. Grâce à un corps enseignant composé d'universitaires et de professionnels expérimentés, le programme offre une formation complète, à la croisée de la modélisation analytique et de l'application concrète.

À l'issue du Master, les étudiantes et les étudiants pourront ainsi intégrer des institutions publiques ou privées en tant que data analysts, analystes marketing ou product managers. Ils pourront également envisager de poursuivre un doctorat en économie.

Les objectifs de la formation :

- Appliquer des méthodes statistiques et économétriques avancées pour produire des analyses fiables et robustes, afin d'orienter la prise de décision dans les entreprises et les institutions publiques ou semi-publiques.
- Maîtriser l'économie des marchés numériques, notamment la conception de stratégies de tarification en ligne et la publicité liée aux moteurs de recherche.
- Acquérir une expertise en programmation pour manipuler des ensembles de données larges et complexes.
- Communiquer efficacement les résultats des analyses économiques, statistiques et économétriques à différents publics, à l'écrit (rapports) comme à l'oral (présentations percutantes).

MODALITÉS D'ENSEIGNEMENT

Tous les cours du parcours D4E sont dispensés en anglais et combinent des enseignements théoriques avec des projets pratiques, permettant aux étudiants d'acquérir les compétences nécessaires pour maîtriser les techniques d'analyse de données.

Le programme couvre deux grands domaines : l'analyse de données et l'économie numérique.

En analyse de données, les étudiants abordent des sujets avancés tels que le machine learning et les réseaux de neurones.

En économie numérique, ils étudient notamment l'économie de la blockchain et les smart contracts.

Tous les cours sont obligatoires, garantissant ainsi une formation complète et cohérente.

Élément clé du programme, l'enseignement le séminaire intitulé « Business Cases » permet à des professionnels du secteur de venir présenter aux étudiants des problématiques concrètes rencontrées dans leurs entreprises. Ils expliquent comment les outils d'analyse de données sont mobilisés pour répondre à ces enjeux, et offrent, lorsque cela est possible, la possibilité aux étudiants de travailler directement sur les données, leur fournissant ainsi une expérience pratique sur des problématiques réelles du monde professionnel.

Le programme se termine par un stage de fin d'études, débutant en mars et d'une durée minimale de six mois.

ADMISSIONS

Les candidats doivent être titulaires d'un diplôme de niveau Master 1 (équivalent à 60 ECTS), obtenu soit à l'issue du Master 1 Quantitative Economics de l'Université Paris Dauphine-PSL, soit d'un autre Master de cette même université, ou encore d'une université en France ou à l'étranger ; ou bien d'un diplôme équivalent délivré par un Institut d'Études Politiques (IEP), une Grande École de commerce ou d'ingénieurs, ou tout autre Grand Établissement reconnu comme équivalent, en France ou à l'international.

Les candidats doivent avoir une formation académique dans l'un des domaines suivants : économie, mathématiques appliquées à l'économie, informatique appliquée à l'économie, ou tout autre cursus comportant une forte composante quantitative.

Une excellente maîtrise de l'anglais est requise.

Pour les étudiants issus d'une université de l'UE, celle-ci doit être attestée par l'un des tests suivants, datant de moins de trois ans :

- **TOEFL iBT** (score minimum : 90)
- **IELTS** (score minimum : 6,5)
- **Cambridge Certificate** (niveau C1)
- **GRE** (scores minimum : 160 en compréhension verbale et en raisonnement quantitatif)

Pour les étudiants ayant effectué la majeure partie de leurs études hors de l'Union européenne, la maîtrise de l'anglais doit être attestée à la fois par un score GRE (minimum : 160 en verbal et en quantitatif) et un test de langue anglaise, parmi :

- **TOEFL iBT** (score minimum : 90)
- **IELTS** (score minimum : 6,5)
- **Cambridge Certificate** (niveau C1)

Tous les résultats doivent dater de moins de trois ans.

Les candidats dont l'anglais est la langue maternelle, ou ceux ayant effectué au moins une année d'études en anglais dans un pays anglophone au cours des deux dernières années et ayant validé les examens correspondants, sont exemptés de ces tests.

PROGRAMME DE LA FORMATION

- Semester 3
 - Data Analytics - 12 ECTS
 - [Machine Learning](#)
 - [Data Science Project](#)
 - [Machine Learning](#)
 - [Time Series and Anomaly Detection](#)
 - Digital Economics - 18 ECTS
 - [Competition and network economics](#)
 - [Blockchain economics](#)
 - [Financial Data et Systemic risk](#)
 - [Private Cryptocurrencies](#)
 - [Experimental Economics](#)
- Semester 4
 - Data Analytics - 12 ECTS
 - [NLP for economic decisions](#)
 - [Machine Learning for Economists](#)
 - [Neural Networks](#)
 - [Data visualisation](#)
 - Digital Economics - 9 ECTS
 - [Platform economics](#)
 - [Solidity and smart contract development](#)
 - [Empirical Industrial Organization](#)
 - Job Market Insertion - 9 ECTS
 - [Business Cases](#)
 - [Communication](#)
 - [Internship](#)

DESCRIPTION DE CHAQUE ENSEIGNEMENT

SEMESTER 3

Data Analytics - 12 ECTS

Machine Learning

ECTS : 6

Enseignant responsable : FABRICE ROSSI (<https://www.ceremade.dauphine.fr/en/members/detail-cv/profile/fabrice-rossi.html>)

Langue du cours : Anglais

Description du contenu de l'enseignement :

The course gives a thorough presentation of the machine learning field and follows this outline:

1. general introduction to machine learning and to its focus on predictive performances (running example: k-nearest neighbours algorithm)
2. machine learning as automated program building from examples (running example: decision trees)
3. machine learning as optimization:
 1. empirical risk minimization
 2. links with maximum likelihood estimation
 3. surrogate losses and extended machine learning settings
 4. regularisation and kernel methods (support vector machines)
4. reliable estimation of performances:
 1. over fitting
 2. split samples
 3. resampling (leave-one-out, cross-validation and bootstrap)
 4. ROC curve, AUC and other advanced measures
5. combining models:
 1. ensemble techniques
 2. bagging and random forests
 3. boosting
6. unsupervised learning:
 1. clustering (hierarchical clustering, k-means and variants, mixture models, density clustering)
 2. outlier and anomaly detection

Compétences à acquérir :

After attending the course the students will

- have a good understanding of the algorithmic and statistical foundations of the main machine learning techniques
- be able to select machine learning techniques adapted to a particular task (exploratory analysis with clustering methods, predictive analysis, etc.)
- be able to design a model selection procedure adapted to a particular task
- report the results of a machine learning project with valid estimation of the performances of their model

Pré-requis obligatoires

- intermediate level in either Python or R. Students are expected to be able to perform standard data management tasks in Python or R, including, but not limited to:
 - loading a data set from a CSV file
 - recoding and cleaning the data set
 - implementing a simple data exploration strategy based on pivot table and on graphical representation
- intermediate level in statistics and probability. Students are expected to be familiar with:
 - descriptive statistics
 - conditional probabilities and conditional expectations
 - core results from statistics: bias and variance concepts, strong law of large numbers, central limit theorem, etc.

Mode de contrôle des connaissances :

- quizzes and tests during the course
- machine learning project

Coefficient : 2

6 (M2 Economie Internationale et Développement)

6 (M2 Diagnostic économique international)

Data Science Project

ECTS : 3

Langue du cours : Anglais

Time Series and Anomaly Detection

ECTS : 3

Enseignant responsable : MADALINA OLTEANU (<https://dauphine.psl.eu/recherche/cvtheque/olteanu-madalina>)

Langue du cours : Anglais

Description du contenu de l'enseignement :

This lecture is thought as an introduction to the analysis of complex data, and particularly to that having a temporal component. Methods aimed at exploring and modelling time series, longitudinal data and graphs with temporal components will be addressed. The issues of detecting patterns, breakpoints, changes of regimes, and anomalies will be at the core of the different approaches. The first chapters will be devoted to hidden Markov models. After having briefly recalled some definitions and properties of Markov processes, we will define hidden Markov processes, illustrate them with several examples and give some of their properties. Inference techniques using the EM algorithm and Bayesian approaches will be presented and illustrated in practice. We will particularly focus on some specific models which are extremely useful for segmenting time series stemming from the economics field, such as autoregressive Markov switching models. The second part of the lecture will tackle the issue of change-point detection methods. We will start by introducing the change-point detection issue. More specifically, we will consider several frameworks and derive inference procedures for computing and locating change-points : online vs. offline strategies, single vs. multiple change point detection, known vs. unknown number of change points, parametric vs. non-parametric approaches. The third chapter will be aimed at introducing the issue of anomaly detection in the context of temporal data. After having defined what an anomaly is, we will start by assessing whether and how hidden-Markov models and change-point analysis may be useful for detecting anomalies. Then, we will compare these two approaches with other techniques, stemming either from the field of computational statistics, or from that of machine learning. During this chapter, we will also consider the questions of detecting patterns and clustering temporal data. The fourth chapter will address data that can be modelled as a graph or a temporal graph. We will start by introduce some definitions and summaries for characterising the network (degree distribution, centrality indices, ...). Afterwards, we will tackle the questions of community detection and graph clustering. Eventually, we will address the issues of random networks and associated tests for randomness. Models and methods introduced in this lecture will be practiced using existing implementations in R and "real-life" datasets.

Compétences à acquérir :

Gain some background and perspective of time series analysis from a data science point of view.

Be able to handle temporal data subject to anomalies and change-points.

Have some basic knowledge about graphs and temporal graphs mining.

Pré-requis obligatoires

Students are expected to have some notions of probabilities, statistical inference theory and time series analysis (ARIMA models). An intermediate

knowledge of R and/or Python is also desirable.

Mode de contrôle des connaissances :

Data challenge. A project to be done individually or by two, analysing real life data.

Machine Learning

ECTS : 6

Enseignant responsable : FABRICE ROSSI (<https://www.ceremade.dauphine.fr/en/members/detail-cv/profile/fabrice-rossi.html>)

Langue du cours : Anglais

Description du contenu de l'enseignement :

The course gives a thorough presentation of the machine learning field and follows this outline:

1. general introduction to machine learning and to its focus on predictive performances (running example: k-nearest neighbours algorithm)
2. machine learning as automated program building from examples (running example: decision trees)
3. machine learning as optimization:
 1. empirical risk minimization
 2. links with maximum likelihood estimation
 3. surrogate losses and extended machine learning settings
 4. introduction to deep learning
4. reliable estimation of performances:
 1. over fitting
 2. split samples
 3. resampling (leave-one-out, cross-validation and bootstrap)
 4. ROC curve, AUC and other advanced measures
5. combining models:
 1. ensemble techniques
 2. bagging and random forests
 3. boosting
6. machine learning for causal inference

Compétences à acquérir :

After attending the course the students will

- have a good understanding of the algorithmic and statistical foundations of the main machine learning techniques
- be able to select machine learning techniques adapted to a particular task
- be able to design a model selection procedure adapted to a particular task
- report the results of a machine learning project with valid estimation of the performances of their model

Pré-requis obligatoires

- intermediate level in either Python or R. Students are expected to be able to perform standard data management tasks in Python or R, including, but not limited to:
 - loading a data set from a CSV file
 - recoding and cleaning the data set
 - implementing a simple data exploration strategy based on pivot table and on graphical representation
- intermediate level in statistics and probability. Students are expected to be familiar with:
 - descriptive statistics
 - conditional probabilities and conditional expectations
 - core results from statistics: bias and variance concepts, strong law of large numbers, central limit theorem, etc.

Mode de contrôle des connaissances :

- quizzes and tests during the course
- machine learning project

Coefficient : 1

Digital Economics - 18 ECTS

Competition and network economics

ECTS : 3

Enseignants : ANTOINE CHAPSAL, ANNA CRETI

<https://dauphine.psl.eu/recherche/cvtheque/creti-anna>

Langue du cours : Anglais

Description du contenu de l'enseignement :

Theory and practice of competition in network industries; antitrust issues; theory of network and network effects; two-sided platforms and pricing

Compétences à acquérir :

Understanding of competition and regulation issues in network and digital economics

Pré-requis obligatoires

Advanced Micro

Pré-requis recommandés

Industrial Organization

Mode de contrôle des connaissances :

Written exam

Bibliographie, lectures recommandées :

Belleflamme-Peitz, Industrial Organization

Blockchain economics

ECTS : 6

Enseignant responsable : LOUIS BERTUCCI (<https://dauphine.psl.eu/recherche/cvtheque/bertucci-louis>)

Langue du cours : Anglais

Description du contenu de l'enseignement :

While this is a fairly recent technology, this class will take students through the fundamentals of blockchains as well as implications regarding financial, economic or social interactions. The class will start by some history needed to understand what lead to the creation of Bitcoin, the first blockchain, in 2009. We will then review the detailed functioning of a blockchain. We will continue by discussing important current developments in the industry as well as implications for the economic environment. Lastly, we will discuss potential future developments and how blockchains will impact a broad range of industries. Students will also be introduced to recent academic work related to blockchains.

Students will be asked to pick a blockchain project from a list and present it briefly during the presentation session in front of the class (group presentation). When reaching this presentation session, students will be expected to be able to assess the pros and cons of a given blockchain project, and have a critical opinion on this project.

Compétences à acquérir :

The objective of this class is to give students a deep theoretical overview of what a blockchain is. Nonetheless we will also use mock-blockchains, write smart contracts and interact with them, through some computer sessions. This will help solidify the knowledge learned and de-mystify the functioning of a blockchain.

Students will gain a deep knowledge of how a blockchain works internally. They will also be very aware of the different issues and perhaps they will be able to spot new use cases for a blockchain.

Pré-requis recommandés

The first prerequisite is coding. Knowledge in Python and/or Javascript will greatly help students perform the homework. Student less familiar with Python are expected to increase their Python skills by the end of the semester.

The second prerequisite is basic economics (competition, market economy, utility maximization).

While knowledge in computer science and economics is needed to properly understand what a blockchain is, we will go through what is needed just to make sure everyone is on the same page. In particular we will go through asymmetric cryptography, distributed networks, consensus, game theory, financial markets and corporate finance. Although students with knowledge in any of those topics will be more comfortable, I intend to present them “from scratch”.

Mode de contrôle des connaissances :

The evaluation is composed of a group presentation (1/3), homework (1/3) and a final exam (1/3). Class participation can be highly rewarded especially for students who struggle with homework. Students are encouraged to actively interact during the class.

Coefficient : 1

Bibliographie, lectures recommandées :

Melanie Swan, Blockchain: Blueprint for a new economy, O'Reilly, 2015

Andreas Antonopoulos, Mastering Bitcoin, 2nd edition, O'Reilly, 2017

Financial Data et Systemic risk

ECTS : 3

Enseignant responsable : Sylvain BENOIT (<https://sites.google.com/site/sylvainbenoit87/>)

Langue du cours : Anglais

Description du contenu de l'enseignement :

The course will equip students with the necessary knowledge to be able to undertake econometric analysis of the type commonly associated with modern financial econometrics research. Substantial emphasis will be placed on the development of programming skills in Python (or in MATLAB, especially for financial contagion and multivariate analysis).

Course outline:

1. Data collection (CRSP-Compustat, Yahoo-Finance, ECB data warehouse)
2. Market Risk Measurement (Value-at-Risk, Expected Shortfall) – ARCH/GARCH models – univariate time series
3. Backtesting tests for market-risk measurement (independence test, unconditional coverage test, conditional coverage test, super exception)
4. Systemic Risk and Macroprudential regulation (SIFIs identification, MES, SRISK, ?CoVaR) – multivariate time series
5. Principal Component Analysis (absorption ratio computation)
6. Contagion models (direct and indirect effects decomposition)

Compétences à acquérir :

The course provides a deep knowledge of the advanced time series techniques and their application to systemic risk. A technical presentation of these models will be given, before studying applications of these models to systemic risk.

Pré-requis recommandés

Time Series Analysis. Python programming.

Mode de contrôle des connaissances :

Individual homework assignment.

Bibliographie, lectures recommandées :

Benoit, S., Colliard, J.-E., Hurlin, C. and C. Pérignon (2017) Where the Risks Lie: A Survey on Systemic Risk, Review of Finance, 21(1), 109-152.

Benoit, S., Hurlin, C. and C. Pérignon (2019) Pitfalls in Systemic-Risk Scoring, Journal of Financial Intermediation, 38, 19-44.

Campbell, S. D. (2004) A Review of Backtesting and Backtesting Procedures, Working paper, Federal Reserve Board.

Christofferson, P. and Pelletier, D. (2004) Backtesting Value-at-Risk: A Duration-Based Approach, Journal of Financial Econometrics, 2(1), 84-108.

Du, Z. and J. C. Escanciano (2015) Backtesting Expected Shortfall: Accounting for Tail Risk, Management Science.

Diebold, F.X. and K. Yilmaz (2009) Measuring Financial Asset Returns and Volatility Spillovers, with Application to Global Equity Markets. The Economic Journal, 119(1), 158-171.

Diebold, F.X. and K. Yilmaz (2012) Better to Give than to Receive: Predictive Directional Measurement of Volatility Spillovers, International Journal of Forecasting, 28(1), 57-66.

Private Cryptocurrencies

ECTS : 3

Enseignant responsable : ROMAIN PLASSARD (<https://dauphine.psl.eu/recherche/cvtheque/plassard-romain>)

Langue du cours : Anglais

Description du contenu de l'enseignement :

The first part of the course characterizes the long-standing project of creating an electronic cash system, analyzes the technical and institutional problems raised by its implementation, and reviews the proposed solutions leading up to Bitcoin. The second part examines the political motivations underlying the design of electronic cash systems.

Compétences à acquérir :

This course examines the origins and development of private cryptocurrencies. By the end of the course, students should be able to:

- Identify the key challenges involved in designing electronic cash systems (e.g., double-spending prevention).
- Describe the cryptographic mechanisms used to secure electronic payments (e.g., blind signature schemes).
- Explain the conditions that enabled the emergence of Bitcoin and subsequent alternatives (e.g., Ripple, Ethereum, ZCash).
- Assess and justify the design choices of different electronic cash systems.

Mode de contrôle des connaissances :

Quizz (40%) and oral presentation (60%).

Bibliographie, lectures recommandées :

- Brunton, F. (2019). Digital Cash: The Unknown History of the Anarchists, Utopians, and Technologists Who Created Cryptocurrency. Princeton University Press.
- Chaum, D. (1983). "Blind Signatures for Untraceable Payments." Advances in Cryptology, Proc. Crypto '82, D. Chaum, R. L. Rivest, & A. T. Sherman (eds.), Plenum Press, New York, pp. 199–203.
- Chaum, D. (1985). "Security Without Identification: Transaction Systems to Make Big Brother Obsolete." Communications of the ACM, 28, pp. 1030–1044.
- Nakamoto, S. (2008). "Bitcoin: A Peer-to-Peer Electronic Cash System."
<https://www.metzdowd.com/pipermail/cryptography/2008-October/014810.html>
- Turner, F. (2006). From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism. University of Chicago Press.

Experimental Economics

ECTS : 3

Enseignant responsable : CLAIRE RIMBAUD (<https://sites.google.com/view/claire-rimbaud/home>)

Langue du cours : Anglais

Description du contenu de l'enseignement :

The module will cover both methodology - why and how experiments in economics are conducted - and specific topics from the experimental literature via recent research articles.

Compétences à acquérir :

The aim of the module is to introduce students to the use of experimental methods in economics.

Coefficient : 2 pour le M2 296 et 0,5 pour le M2 346

Bibliographie, lectures recommandées :

Charness, G., & Pingle, M. (Eds.). (2021). The art of experimental economics: twenty top papers reviewed. Routledge.

Friedman, D., & Sunder, S. (1994). Experimental methods: A primer for economists. Cambridge university press.

Moffatt, P., Starmer, C., Sugden, R., Bardsley, N., Cubitt, R., & Loomes, G. (2009). Experimental economics: Rethinking the rules. Princeton University Press.

+ articles cited in class.

NLP for economic decisions

ECTS : 3

Langue du cours : Anglais

Description du contenu de l'enseignement :

General introduction: aims and uses of NLP

Part I: translating texts into quantities

1. Tokenization, preprocessing
2. Word frequency and inverse-document frequency (tf and tf-idf)
3. Word embeddings

Part II: Traditional NLP methods

Methods used before LLMs

1. Text classification
2. Topic modelling and text summarization
3. Sentiment analysis

Part III: NLP with LLMs

1. Short presentation of LLMs: transformers, encoders-only models, decoders-only models
2. Text classification with LLM
3. Topic modelling and text summarization
4. Sentiment analysis
5. Generating prompt for generative LLM
6. Fine-tuning of LLM

Compétences à acquérir :

At the end of this course, the students should:

- have a good knowledge of the main methods used in Natural Language Processing
- be able to implement these methods to data with Python
- be able to interpret the results obtained through these examples

Pré-requis recommandés

Basic knowledge of Python, knowledge of classifications methods in Data science

Mode de contrôle des connaissances :

The evaluation is based on a project made by groups of two students

Coefficient : 2 pour le M2 296 et 0,5 pour le M2 346

Bibliographie, lectures recommandées :

- Albrecht, Jens, Ramachandran, Sidharth, Winkler, Christian. *Blueprints for text analytics using Python machine learning-based solutions for common real world (NLP) applications*, O'Reilly, 2020
- Alammur Jay and Maarten Grootendorst. *Hands-On Large Language Models, Language Understanding and Generation*, O'Reilly, 2024
- Useful website: Kaggle

Machine Learning for Economists

ECTS : 3

Enseignant responsable : Mathilde GODARD (<https://sites.google.com/site/mathildegodard1/>)

Langue du cours : Anglais

Description du contenu de l'enseignement :

Economic science has evolved over several decades toward greater emphasis on empirical work. Ever increasing mass of available data ('big data') in the past decade is likely to have a further and profound effect on economic research (Einav and Levin, 2014). Beyond economic research, governments and the industry are also increasingly seeking to use 'big data' to solve a variety of problems, usually making use of the toolbox from machine learning (ML).

The question we ask in this course is the following : What do we (not) learn from big data and ML as economists? Is ML merely applying standard techniques to novel and large datasets? If ML is a fundamentally new empirical tool, how does it fit with what we know? In particular, how does it fit with our tools for causal inference problems? As empirical economists, how can we use big data and ML? We'll discuss in detail how ML is useful to collect new data, for prediction in policy, and to provide new tools for estimation and inference.

Compétences à acquérir :

Course objectives:

1. Present a way of thinking about ML that gives it its own place in the econometric toolbox.
2. Develop an intuition of the problems to which it can be applied, and its limitations.
3. Think of unstructured data (text, image) as data we can use when economic outcomes are missing.
4. Specific focus on application of ML to social policies (health/labor/taxation/environment etc.).

Pré-requis recommandés

Python (beginner/intermediate), Machine Learning, Microeconometrics.

Mode de contrôle des connaissances :

Grading:

1. In-class pairwise presentation of an academic paper (30% of overall grade).
2. Final exam (in-class written text). 70% of overall grade.

Coefficient : 2 pour le M2 296 et 0,5 pour le M2 346

Bibliographie, lectures recommandées :

- Mullainathan, Sendhil and Jann Spiess (2017). "Machine learning: An applied econometric approach". In: Journal of Economic Perspectives 31.2, pp. 87-106.
- Kleinberg, Jon et al. (2015). "Prediction policy problems". American Economic Review 105.5, pp. 491-495.
- Athey, S. (2017): "Beyond prediction: Using big data for policy problems", Science 355, 483-485.
- Kleinberg, J., Lakkaraju, H., Leskovec, J., Ludwig, J. and S. Mullainathan (2018): "Human Decisions and Machine Predictions", The Quarterly Journal of Economics, Volume 133, Issue 1, Pages 237-293.
- Susan Athey, Guido W. Imbens. 2019. Machine Learning Methods That Economists Should Know About. Annual Review of Economics 11:1, 685-725.
- Athey, Susan, and Guido Imbens. 2016. "Recursive Partitioning for Heterogeneous Causal Effects". PNAS 113(27): 7353-60.
- Belloni, A., V. Chernozhukov, S. Mullainathan and J. Spiess and C. Hansen.(2014): "High-Dimensional Methods and Inference on Structural and Treatment Effects" Journal of Economic Perspectives, Volume 28, Number 2 – Spring 2014, Pages 29-50

Data visualisation

ECTS : 3

Langue du cours : Anglais

Neural Networks

ECTS : 3

Enseignant responsable : JOSEPH RYNKIEWICZ

Langue du cours : Anglais

Solidity and smart contract development

ECTS : 3

Enseignant responsable : TIANCHAN DONG

Langue du cours : Anglais

Description du contenu de l'enseignement :

Blockchain is an amalgamation of several existing technologies. This course begins with an introduction to the historical developments, technologies, and ideologies that led to the emergence of blockchain. Students will then explore the layered architecture of blockchain systems and analyze the key technical and economic factors influencing each layer. To illustrate these concepts, smart contracts will be used to programmatically simulate system behaviors and design mechanisms. By the end of the first half of the course, students will have completed the full smart contract development lifecycle using the Remix IDE.

The second half of the course adopts a case study approach to examine real-world blockchain applications. Participants will apply both analytical reasoning and the technical skills developed earlier in the course to formulate consultative assessments and solution strategies for contemporary blockchain use cases.

Compétences à acquérir :

By the end of this course, participants will demonstrate the ability to:

1. Interpret and articulate blockchain system architecture, including peer-to-peer networking, consensus mechanisms, and application-layer components.
2. Assess the technical robustness of blockchain projects.
3. Assess the security and economic aspects of smart contracts.
4. Implement core Ethereum standards and protocols in practical contexts involving cryptocurrencies, NFTs, and DAOs.
5. Collaborate effectively in open-source environments by utilizing Github and Remix tooling, and community-driven development practices.

Pré-requis obligatoires

Mastery in at least one programming language. Preferably Javascript.

Fundamental theory of blockchain presented in the previous semester.

Pré-requis recommandés

Familiarity with Remix IDE.

Basic understanding of computer concepts such as data structure and networking.

Mode de contrôle des connaissances :

1. A weekly, 15min group presentation which expands on lecture topics.
2. Bi-weekly homework projects.
3. Final DAO project.

Bibliographie, lectures recommandées :

Solidity Documentation - <https://docs.soliditylang.org/en/latest/>

Code examples - <https://solidity-by-example.org/>

Platform economics

ECTS : 3

Langue du cours : Anglais

Empirical Industrial Organization

ECTS : 3

Enseignant responsable : Daniel HERRERA ARAUJO

Langue du cours : Anglais

Coefficient : 2 pour le M2 296 et 0,5 pour le M2 346

Job Market Insertion - 9 ECTS

Business Cases

Langue du cours : Anglais

Description du contenu de l'enseignement :

The lecture is a sequence of use-cases in the industry and in the service business performed by professionals.

Compétences à acquérir :

Knowing some of the most common use cases of data sciences in firms decision making business.

Mode de contrôle des connaissances :

Presentation of a resume of the lectures before a jury.

Communication

Langue du cours : Anglais

Internship

ECTS : 9

Langue du cours : Anglais

Description du contenu de l'enseignement :

Students must intern at a company (semester 4) for at least 4 months.

Compétences à acquérir :

The students should also complete an end-of-studies internship lasting at least 4 months. The curriculum includes guest lectures by visiting professionals on issues related to Big Data, providing another means of connecting with relevant business circles.

Mode de contrôle des connaissances :

The internship will conclude with a report to be reviewed by a committee.

Coefficient : 1,5

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