PGE – MSc in Management

AI For Business

Course Code MK348

2017-2018

1. COURSE SPECIFICATIONS*

TEACHING LANGUAGE	ENGLISH
ECTS CREDITS	5
OFFICE HOURS	TBA – cherny@em-lyon.com
INSTRUCTIONAL DESIGNER	CHERNY Lynn
ADMINISTRATIVE ASSISTANT	ALESSI Marine
LEVEL	beginner
PRE-REQUISITES	None
RULES	Attendance is required because there is graded work each week in class. Non-attendance for whatever reason will reduce your grade.

2. COURSE DESCRIPTION*

This course will educate you about the current technology and uses of AI and Machine Learning, from the algorithms to the business use cases. The content is technical and requires a lot of reading. There is no programming, but there are demos showing the algorithms working. There are weekly in-class projects, presentations, and a final project.

3. PROGRAMME LEARNING GOALS AND OBJECTIVES*

3.1.   Programme learning goals *(this section does not need to be completed)*

1	Our graduates are aware/sensitive to a disrupted world
2	Our graduates master business basics and disruptive business competencies
3	Our graduates develop a creative mindset and are able to make ideas happen
4	Our graduates reflect on themselves and project themselves in the future

3.2.   Links of the course to the programme objectives* *(Please check the learning objectives of the program to which the course contributes the most (at least 1 to maximum 4)*

Learning objectives (LO) of the programme	Course Matching
PGE - MSc in Management	
Graduates of the programme are able to identify key relevant technological, scientific and societal disruptions and apply their insights to business situations, projects or issues.	☐ Yes
Graduates of the programme are able to adopt a global perspective, mindset and competences when dealing with various business situations, projects or issues	☐ Yes
Graduates of the programme know and effectively use basic concepts, knowledge and theories in the main business subjects and are able to integrate them in a systemic approach	☒ Yes
Pour les tracks IDEA et ETD uniquement : *- ETD : Our students acquire advanced knowledge and skills to operate in different European countries* *- IDEA : Our students acquire advanced knowledge and skills to develop innovative ideas and projects*	☒ Yes
Graduates of the programme are able to identify alternative/emergent business concepts, knowledge and theories and are able to apply them to various business situations, projects or issues.	Yes
Graduates of the programme are able to question proven approaches and solutions to business problems and apply creativity and design techniques to enlarge the scope of their analysis, enabling them to bring new creative solutions.	Yes
Graduates of the programme are able to demonstrate a sense of responsibility and upholds their values and principles when dealing with colleagues, instructors, employers or business partners	Yes
Graduates of the programme are able to systematically appraise their learning/working experiences and take active steps to know themselves better in order to develop self-	Yes

improvement strategies	

4. LEARNING HOURS ANALYSIS*

Type of learning Hours	Distribution (hours)
Face-to-Face (lecture) *(24 hours max)*	24
Online working Hours	8
Individual working hours *(with mentoring or not)*	25
Team working hours *(with mentoring or not)*	10
Evaluation	4
TOTAL	=0

5. LEARNING OBJECTIVES / OUTCOMES

5.1. Academic outcomes *(identify a maximum of 5 learning objectives)*

5.1.1. Concepts and theories to which participants are exposed during the course*

1	Big Data
2	Machine Learning
3	Artificial Intelligence
4	Neural nets for images and text (RNN, CNN, LSTM, word-embeddings)
5	Ethics and biases in data and algorithms

5.1.2. Knowledge acquired during the course *

After this course, participants know or master	Understand current uses of data in ML and AI algorithms
After this course, participants know or master	Understand current neural net architectures
After this course, participants know or master	Understand applications of machine learning and neural nets in business
After this course, participants know or master	Recognize data set bias and ethics issues
After this course, participants know or master	

5.1.3. Competencies acquired during the course *

After this course, participants are able to	Talk intelligently about big data usage in business contexts
After this course, participants are able to	Evaluate claims for machine learning and AI
After this course, participants are able to	Recognize and use basic terms for neural net architectures

After this course, participants are able to	Design systems and products for ethical use of user data
After this course, participants are able to	Free composition

5.2. Professional outcomes

5.2.1 Productions/Deliverables participants will be able to present after taking this course*

1	Projects around big data algorithm usage in a business context – proposing new products or extensions to existing businesses that make use of recent data science innovations
2	Presentations and demos of current AI research and applications
3	Free composition

5.2.2 The people that participants will have met or contacted during the course: (professors, guest speakers, tutors, companies, external experts, participants…)

Lynn CHERNY, professor of data science
Free composition
Free composition
Free composition
Free composition
Free composition

6. ASSESSMENT OF LEARNING OBJECTIVES* *(please re-enter the n° of the learning objectives checked in part 3.2 and explain in a few words the assessment method)*

- Quizzes every week: 20%
- Final quiz: 20%
- Class activities and participation: 20%
- Final project: 25%
- In-class presentations: 15%

7. SEQUENCES DESCRIPTION, LEARNING ACTIVITIES AND ASSIGNMENTS

Week 1: Intro and Big Data

Week 2: ML and Big Data

Week 3: AI

Week 4: Images and AI

Week 5: Text and RNNs

Week 6: Word Embeddings

Week 7: Explainable AI, ML, and UI

Week 8: Biases and Ethics

See specifics in github repo here: https://github.com/arnicas/AI_for_BusinessCourse

📱 **8. PEDAGOGICAL RESOURCES AND ACTIVITIES (videos, books, articles, links, etc)***

See the repo here for up to date information on readings weekly:
https://github.com/arnicas/AI_for_BusinessCourse

Draft:

Week 1: Big Data

In Class

- Intro to topics: Socher Video on AI in orgs (5 mins): https://www.youtube.com/watch?v=kpqPFUu9JvU&feature=youtu.be
- Big Data is Better: Kenneth Cukier, https://www.youtube.com/watch?v=8pHzROP1D-w (quiz questions)
- Explaining Big Data: https://www.youtube.com/watch?v=7D1CQ_LOizA
- What is Big Data and Hadoop: https://www.youtube.com/watch?v=FHVuRxJpiwI

Class Activities

Carrefour Ecully. What data do they have access to? What application could they make of it? Brainstorm excercise, group with most items wins.

Readings (For Quiz)

- What is Big Data on Safari Online. https://www.safaribooksonline.com/library/tutorials/big-data-ots/1970/
- More data than meets the eye: Structured and Unstructured Data, Safari Online:https://www.safaribooksonline.com/library/tutorials/big-data-ots/1971/
- Most valuable commodity is now data: http://www.economist.com/news/leaders/21721656-data-economy-demands-new-approach-antitrust-rules-worlds-most-valuable-resource
- McKinsey Big Data summary paper in module.
- Warnings about data from Angela Bassa: https://medium.com/@angebassa/data-alone-isnt-ground-truth-9e733079dfd4

Other HW (answer in the quiz)

- Find some datasets hosted on Amazon or Google. Do some research on datasets. Find at least one containing over a GB of data.

- Group presentation assignments: Spark, BigQuery - how are they different from Hadoop?

Week2: Machine Learning

In Class

- Class presentations. (Fair game for quiz questions.)
- Video, A Friendly Introduction to ML (Luis Serrano): https://www.youtube.com/watch?v=IpGxLWOIZy4
- StitchFix algorithms: http://algorithms-tour.stitchfix.com/
- Demo classifier(s) and clustering.

Class Activities

- Data labeling for classification algorithm. Decision making problem. What would you do with the false positives and false negatives. What is their impact?
- TODO: Wine dataset

HW Reading (for Quiz)

- Read Chaper 1 of Weapons of Math Destruction: What is a Model.
- Chapter 2 of Data Science for Business: https://www.safaribooksonline.com/library/view/data-science-for/9781449374273/ch02.html
- Vocabulary Basics and relationships: Intro to AI and ML by Liza Daly https://worldwritable.com/ai-literacy-the-basics-of-machine-learning-2e20f93e34b4 https://worldwritable.com/
- Predication and Classification and Neural Nets: https://worldwritable.com/ai-literacy-what-artificial-intelligence-can-do-part-2-cbca0fc75a93
- Terminology that appears in ML and some algorithms: https://www.becomingadatascientist.com/2017/07/17/introductory-machine-learning-terminology-with-food/
- Bias/Variance: Overfitting and Underfitting, Bias-Variance Dilemma: https://ml.berkeley.edu/blog/2017/07/13/tutorial-4/
- A Few Useful Things to Know About Machine Learning - Pedro Domingos article summarized here: http://machinelearningmastery.com/useful-things-to-know-about-machine-learning/ (PDF of the article it summarizes here: http://web.cs.hacettepe.edu.tr/~aykut/classes/spring2013/bil682/readings/week4/machine-learning-review-domingos.pdf)

- Compulsory sections

- On Perceptrons - to prepare for AI. https://ml.berkeley.edu/blog/2016/12/24/tutorial-2/

Homework presentation assignments

- Naive Bayes
- Precision/Recall
- SVM's
- Decision Trees - find some more examples.

Week 3: AI Intro.

In Class

- Class presentations on ML algs.
- Video: Friendly Intro to NeuralNets: https://www.youtube.com/watch?v=BR9h47Jtqyw
- Demo of math inside: https://ml.berkeley.edu/blog/2017/02/04/tutorial-3/
- Demo of weights and simple error: http://www.emergentmind.com/neural-network
- tensorflow demos: http://playground.tensorflow.org/#activation=tanh&batchSize=10&dataset=circle&regDataset=reg-plane&learningRate=0.03&regularizationRate=0&noise=0&networkShape=4,2&seed=0.17251&showTestData=false&discretize=false&percTrainData=50&x=true&y=true&xTimesY=false&xSquared=false&ySquared=false&cosX=false&sinX=false&cosY=false&sinY=false&collectStats=false&problem=classification&initZero=false&hideText=false
- Karpathy's demo: http://cs.stanford.edu/people/karpathy/convnetjs/demo/classify2d.html
- https://pair-code.github.io/deeplearnjs/demos/model-builder/model-builder-demo.html

Class activities

Run logistic regression vs neural net. Results? (Replace data.) Carrefour ML applications now? Start working on homework research.

Readings for quiz

- Artificial Intelligence - Deep Learning, a Non-Technical Introduction (pdf) (Alfred Pong) [source: https://www.slideshare.net/AlfredPong1/deep-learning-a-

- Compulsory sections

nontechnical-introduction-69385936?utm_content=buffer2201e&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer]
- Accessible intro: https://techcrunch.com/2017/04/13/neural-networks-made-easy/
- Backup explanation in case it helps: https://medium.com/@mark_riedl/introduction-to-neural-nets-without-the-brain-metaphor-874e7950bca0
- More technical neural net explanation: https://ml.berkeley.edu/blog/2017/02/04/tutorial-3/
- On Backpropogation:
  - https://mattmazur.com/2015/03/17/a-step-by-step-backpropagation-example/
  - https://en.wikipedia.org/wiki/Backpropagation
- Business reports:
  - McKinsey article: https://cloudtweaks.com/2017/08/mckinseys-state-machine-learning-ai-2017/?utm_content=bufferfeb38&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer (and associated reports incl pdf)
  - Intro to HBR series on AI: https://hbr.org/cover-story/2017/07/the-business-of-artificial-intelligence
  - Salesforce: https://www.wired.com/story/inside-salesforces-quest-to-bring-artificial-intelligence-to-everyone/

Homework Presentations (Randomly Picked)

Find a business application of AI (french or english) that hasn't been recorded on the class spreadsheet yet (you need a URL to an article/description of it) and prepare to summarize it for the class.

Week4: Images and AI

In class

- FeiFei Li video talk: https://www.ted.com/talks/fei_fei_li_how_we_re_teaching_computers_to_understand_pictures
- Intro video from Strata conf - just image part of it: https://www.safaribooksonline.com/learning-paths/learning-path-machine/9781491987346/9781491931011-video212013

- Friendly Intro to CNNs and Images (30m) by Luis Serrano (for quiz): https://www.youtube.com/watch?v=2-Ol7ZB0MmU
- Video backup by Brandon Rohrer: https://www.youtube.com/watch?v=FmpDIaiMIeA
- Video extract of Hot Dog or Not. Read how they made it.
  - https://medium.com/@timanglade/how-hbos-silicon-valley-built-not-hotdog-with-mobile-tensorflow-keras-react-native-ef03260747f3
- Demos of image recognition:
  - MNIST demos in the browser: http://myselph.de/neuralNet.html
  - Watch it learn in Karpathy's demo: http://cs.stanford.edu/people/karpathy/convnetjs/demo/mnist.html
  - Another one: https://pair-code.github.io/deeplearnjs/demos/model-builder/model-builder-demo.html
  - More libraries in the browser: https://tenso.rs/#readmore
  - Demo Google cloud api/Azure tool with champagne images.
- Demos of Artistic AI:
  - Google Arts Experiments: https://www.google.com/culturalinstitute/beta/project
  - Sketch-RNN demo: https://aiexperiments.withgoogle.com/sketch-rnn-demo

Class activities:

Champagne or not? labels on data. Retrain the inception model:

- Model test from https://codelabs.developers.google.com/codelabs/tensorflow-for-poets/index.html#8

Readings:

- Companion article to Fei Fei video: https://qz.com/1034972/the-data-that-changed-the-direction-of-ai-research-and-possibly-the-world/
- Text version of class video by Brandon Rohrer: http://brohrer.github.io/how_convolutional_neural_networks_work.html
- More technical writeup: http://colah.github.io/posts/2014-07-Conv-Nets-Modular/
- Business apps:
  - http://www.ibtimes.co.uk/this-teen-has-created-affordable-ai-system-speed-diagnosis-diabetic-retinopathy-1633553
  - Fashion week analysis using AI: https://inside.edited.com/deep-learning-our-way-through-fashion-week-ea55bf50bab8
  - Style transfer to design clothes reference: https://arxiv.org/pdf/1707.09899.pdf
- AI creativity: deepdream, style transfer:
  - Style transfer explanation and examples: https://deepart.io/latest/

- o Example recently: https://chrisrodley.com/2017/06/19/dinosaur-flowers/
- o Deep dream: https://research.googleblog.com/2015/06/inceptionism-going-deeper-into-neural.html
- o https://www.nytimes.com/2017/08/14/arts/design/google-how-ai-creates-new-music-and-new-artists-project-magenta.html?_r=0
- o Magenta: https://magenta.tensorflow.org/welcome-to-magenta
- o Artists and Machine Intelligence: https://medium.com/artists-and-machine-intelligence
- o Suggested mailing list: Creative AI newsletter from Luba Elliot: http://iambic.us15.list-manage1.com/subscribe?u=c7e080421931e2a646364e3ef&id=a23c388b9d

Homework

Ideas for business applications using image recognition or style transfer. Use Carrefour if you want. Or art experiments you tried online.

Week5: Text and RNNs

Class

- Class presentations.
- Intro video (8m): Chris Manning. https://www.youtube.com/watch?v=mU_A-EgB38s
- Video in class, Brandon Rohrer on LSTMs and RNNs: https://www.youtube.com/watch?v=WCUNPb-5EYI&t=1s
- Demos:
  - o Show Show&Tell paper - image recognition plus LSTM generation of description.
  - o DeepMoji article and demo: https://www.technologyreview.com/s/608387/an-algorithm-trained-on-emoji-knows-when-youre-being-sarcastic-on-twitter/?set=608492, Demo: http://deepmoji.mit.edu/
  - o Char-RNN generator Karpathy: Recurrentjs in browser. http://cs.stanford.edu/people/karpathy/recurrentjs/
  - o Janelle Shane's results: http://lewisandquark.tumblr.com/
  - o Writing app botnik: http://apps.botnik.org/voicebox/

Class Activity:

- Train char-rnn or word-rnn models and show results.

Reading:

- Unreasonable Effectiveness of Big Data paper (pdf)
- The Great AI Awakening (long read) - NYT on machine-translation https://www.nytimes.com/2016/12/14/magazine/the-great-ai-awakening.html?_r=0
- Roger Schank on AI bullshit (lack of real world knowledge): https://www.linkedin.com/pulse/press-has-stop-ai-bs-havent-clue-what-writing-roger-schank?trk=mp-reader-card
- Good explanation: Understanding LSTM Networks, Chris Olah. http://colah.github.io/posts/2015-08-Understanding-LSTMs/
- Unreasonable effectiveness of RNN's: http://karpathy.github.io/2015/05/21/rnn-effectiveness/ - read on the the descriptions and extensions!
- Chris Manning overviews: Watch / read Stanford lecture:
  - https://www.youtube.com/watch?v=OQQ-W_63UgQ&list=PL3FW7Lu3i5Jsnh1rnUwq_TcylNr7EkRe6&index=1
  - The Slides: https://web.stanford.edu/class/cs224n/lectures/cs224n-2017-lecture1.pdf
  - Read: http://mitp.nautil.us/article/170/last-words-computational-linguistics-and-deep-learning
- Business Apps:
  - https://venturebeat.com/2017/07/07/ai-and-bots-the-buzz-about-powerful-customer-loyalty-is-real-vb-live/
  - Generate Drug Brand names using neural net: https://www.klick.com/health/news/blog/strategy/generating-drug-brand-names-with-neural-networks/?utm_content=bufferab184&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer
  - Fun: http://www.montag.wtf/fun-with-neural-networks/

HW

Research conversational bots, and Taye.

Week6: Word Embeddings

Class:

- Video, very high level (8m), LexHub Videos: https://www.youtube.com/watch?v=Eku_pbZ3-Mw
- Demos:
  - http://vectors.nlpl.eu/explore/embeddings/en/

- o for Analogies: http://bionlp-www.utu.fi/wv_demo/
- o Vis in tsne: http://colah.github.io/posts/2015-01-Visualizing-Representations/
- o My Yelp word2vec: https://bl.ocks.org/arnicas/dd2ef348ad8854e40ef2
- o Load job ads data into tensorboard too

Class activity

Answer some bias questions.

Load some embeddings into tensorboard projector and answer some questions about them. (Analogy tests on website too.)

- Tool info: https://www.tensorflow.org/programmers_guide/embedding
- Public projector using 10K word2vec: http://projector.tensorflow.org/

Do a sprite tsne example.

Readings

- Learning Word Vectors: https://blog.acolyer.org/2016/04/21/the-amazing-power-of-word-vectors/

- Technical overview of embeddings: http://colah.github.io/posts/2014-07-NLP-RNNs-Representations/

- Another explanation: http://mccormickml.com/2016/04/19/word2vec-tutorial-the-skip-gram-model/ Biases in Word Vectors:

- Scientists Taught a Robot Language. It Immediately Turned Racist. https://www.buzzfeed.com/nidhisubbaraman/robot-racism-through-language?utm_term=.miZN1KPpe#.uyYDJIZGk

- Man is to Computer Programmer as Woman is to Homemaker? Debiasing word embeddings, by Tolga Bolukbasi et al., working with Microsoft Research (pdf)

- ConceptNet article on biases: https://blog.conceptnet.io/2017/04/24/conceptnet-numberbatch-17-04-better-less-stereotyped-word-vectors/

- Some useful tech review and info in Jurafsky and Martin (draft): http://web.stanford.edu/~jurafsky/slp3/8.pdf

- Applications in business:

  - o Le Bon Coin: http://bytes.schibsted.com/translating-words-vectors-embeddings/

o   Style2Vec etc.

- Check out fashion-mnist dataset.

HW Presentations:

What other "2vec" examples can you find? What are they encoding? What bias might exist in this data?

Week7: Explainable AI, ML, and UI

In Class Videos/Demos

- TBD

Class Activity

Design an AI text or vision system that includes visibility into the role of the alogorithm and opportunity for user correction.

Readings

- https://www.oreilly.com/ideas/ideas-on-interpreting-machine-learning?platform=hootsuite&utm_content=buffer88a55&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer
- Dark Secret at Heart of AI: https://www.technologyreview.com/s/604087/the-dark-secret-at-the-heart-of-ai/
- Cracking open the black box: http://www.sciencemag.org/news/2017/07/how-ai-detectives-are-cracking-open-black-box-deep-learning
- When Not to Use Deep Learning http://www.datasciencecentral.com/profiles/blogs/when-not-to-use-deep-learningHype: http://gizmodo.com/why-everyone-is-hating-on-watson-including-the-people-w-1797510888
- https://hbr.org/2016/11/the-simple-economics-of-machine-intelligence
- What NASA could Teach Tesla about Autopilot: https://www.scientificamerican.com/article/what-nasa-could-teach-tesla-about-autopilot-s-limits/
- Is AI powered government worth it? https://medium.com/world-economic-forum/rage-against-the-machines-is-ai-powered-government-worth-it-d003a0488f02
- State of Explainable AI: https://medium.com/@jschwiep/the-state-of-explainable-ai-e252207dc46b

- Building Apps:
  - https://medium.com/merantix/applying-deep-learning-to-real-world-problems-ba2d86ac5837
  - Implementing a RecSys: https://www.safaribooksonline.com/library/view/predictive-analytics-for/9781119267003/06_9781119267003-ch02.xhtml#h2-2
  - https://www.slideshare.net/BenjaminLe4/deep-learning-for-personalized-search-and-recommender-systems

HW

Presentations to prepare

Week8: Biases and Ethics in ML

In Class

- Kate Crawford video from Strata, Algorithmic Illusions: https://www.youtube.com/watch?v=irP5RCdpilc
- Jer Thorp, Make Data More Human: https://www.ted.com/talks/jer_thorp_make_data_more_human

Class activities

Readings

- Overview: https://www.theguardian.com/inequality/2017/aug/08/rise-of-the-racist-robots-how-ai-is-learning-all-our-worst-impulses?CMP=share_btn_tw
- European Right to an Explanation: https://arxiv.org/abs/1606.08813
- How Big Data is Unfair: https://medium.com/@mrtz/how-big-data-is-unfair-9aa544d739de
- 6 Provocations for Big Data (pdf)
- Surveillance Capitalism (Zuboff) (pdf)
- Wired: https://www.wired.com/story/machines-taught-by-photos-learn-a-sexist-view-of-women/
- Inspecting Algorithms for Bias (COMPAS) https://www.technologyreview.com/s/607955/inspecting-algorithms-for-bias/
- Machine Bias: https://www.propublica.org/article/machine-bias-risk-assessments-in-criminal-sentencing

- Automation impact on Jobs: http://mitsloan.mit.edu/newsroom/articles/when-the-automatons-explode/
- Tech Check: Is your company ready for AI? https://hackernoon.com/the-ai-hierarchy-of-needs-18f111fcc007

HW Project

Group presentations

Further References

- https://fairmlclass.github.io/

(i) **9. OTHER USEFUL INFORMATION**

Please use the discussion forums. If you are interested in doing more technical work (using the demos I show, etc.) let me know and we can arrange it.

---END OF DOCUMENT---

Date* : 03/09/2017   **Document status* :** Draft