ARTIFICIAL INTELLIGENCE RESEARCH INTERNSHIPS 2019

ACCENTURE LABS DUBLIN

ABOUT

Funding: Accenture Labs

Profiles: Students enrolled in MSc or PhD (Computer Science or Computer Engineering).

Durations: Variable (3-6 months – see next slides)

When: 2019 (spring/summer/autumn). Dates are flexible.

Where: Accenture Labs Dublin, Accenture The Dock

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INTERNSHIP 1
MULTI-LINK PREDICTIONS IN KNOWLEDGE GRAPH EMBEDDINGS

Theme: Explainable Artificial Intelligence

Duration: 4 months

Profile: Student enrolled in MSc or PhD (Computer Science or Computer Engineering).

Keywords: machine learning, deep learning, Python, numpy, tensorflow

Content: Knowledge graph embeddings are a powerful tool to help predict the relevance of possible new links in a given knowledge graph. The state of the art is limited to predicting unique <S,P,O> relations. This project will look into extending that into predicting paths of triples. This will enable use-case such as predicting a possible chain of actions or a combinations of actions to perform (e.g. in the case of experience-based AI).

Useful pointers:

https://link.springer.com/content/pdf/10.1007%2Fs00521-018-3384-6.pdf

INTERNSHIP 2
NEURO-EVOLUTION FOR TRAINING EMBEDDINGS

Theme: Explainable Artificial Intelligence

Duration: 4 months

Profile: Student enrolled in MSc or PhD (Computer Science or Computer Engineering).

Keywords: machine learning, genetic algorithms, Python, tensorflow

Content : Knowledge graph embeddings are a powerful tool to help predict the relevance of possible new links in a given knowledge graph. As Knowledge graph embedding models are neural networks architectures, there is an opportunity to train them using neuro-evolution instead of the common gradient approaches. The intern will learn about neuro-evolution techniques and implement an approach for embeddings graphs.

INTERNSHIP 3
TRAIN A LINEAR SEPARATOR WITH GENETIC ALGORITHMS

Theme: Explainable Artificial Intelligence

Duration: 4 months

Profile: Student enrolled in MSc or PhD (Computer Science or Computer Engineering).

Keywords: machine learning, genetic algorithms, Python, tensorflow

Content: The intern will explore and experiment the adoption of genetic algorithms to train a linear separator working on a very large feature space, with the ultimate goal of designing a better performing and more explainable model for regression tasks.

INTERNSHIP 4
EXPLANATIONS FOR NEURAL KNOWLEDGE GRAPH EMBEDDING MODELS

Theme: Explainable Artificial Intelligence

Duration: 4-6 months

Profile: Student enrolled in MSc or PhD (Computer Science or Computer Engineering).

Keywords: machine learning, deep learning, Python, numpy, tensorflow

Content: Knowledge graph embedding models are neural networks architectures designed to predict links in large-scale knowledge graphs. Nevertheless, they rely on opaque neural network architectures. The intern will be in charge of developing global and local post-hoc interpretability techniques to explain such models to end users.

Useful Links:

https://arxiv.org/abs/1706.07979
https://ieeexplore.ieee.org/document/8047276

INTERNSHIP 5
SURPRISE-DRIVEN GRAPH EMBEDDINGS

Theme: Computational Creativity, Explainable Artifical Intelligence

Duration: 4-5 months

Profile: Student enrolled in MSc or PhD (Computer Science or Computer Engineering).

Keywords: Python, Tensorflow, Neural Network, Knowledge Graph

Content: Deep learning has been applied to create latent vector representations of entire graphs, called graph embeddings. In computational creativity, 'surprise' is often used a metric to measure the quality of a new artefact in tandem with other metrics. For this internship, the intern will explore the suitability of applying various surprise metrics to the creation of the latent vector representations of graphs and deliver results on the efficacy and comparative value of different surprise metrics to this task.

INTERNSHIP 6
IMPLEMENT NEURAL KNOWLEDGE GRAPH EMBEDDINGS MODELS

Theme: Explainable Artificial Intelligence

Duration: 4 months

Profile: Student enrolled in MSc or PhD (Computer Science or Computer Engineering).

Keywords: machine learning, deep learning, Python, numpy, tensorflow

Content: Knowledge graph embedding models are neural networks architectures designed to predict links in large-scale knowledge graphs. The intern will be in charge of developing recently proposed neural graph embedding models using state-of-the art deep learning frameworks.

Useful Links:

https://arxiv.org/abs/1806.01261
https://arxiv.org/abs/1707.01476
https://arxiv.org/abs/1703.06103
http://proceedings.mlr.press/v48/niepert16.pdf
https://arxiv.org/pdf/1802.00934

INTERNSHIP 7
GENERATIVE DESIGN FOR COMPUTATIONAL CREATIVITY

Theme: Computational Creativity

Duration: 4/5 months

Profile: Student enrolled in MSc or PhD (Computer Science or Computer Engineering).

Keywords: Python, Tensorflow, Neural Network, Generative Adversarial Networks

Content: Many industries face the problem of discovering new artefacts, e.g., drug companies wish to discover new molecules which eventually will have a health benefit. The size of potential new artefacts is large, e.g., the total number of small molecules is estimated to be between 10^{60} and 10^{200}. It is impossible to synthesise and test every potential new artefact. The intern will apply the latest AI techniques to discovery new artefacts that are most likely to have desired properties. The intern will design and implement a generative model that will suggest new molecular structures for investigation.

INTERNSHIP 8
MODELS FOR MILK PRODUCTION

Theme: Farming X.0

Duration: 3 months

Profile: Student enrolled in MSc or PhD (Computer Science or Computer Engineering).

Keywords: data analytics, machine learning, Python,

Content: We are working on putting together several models to work combined within a complex system model. The objective of the internship would be to bring the external expertise about the specific models for grass, cows, farmers, etc. into our team to validate the output generated by the complex system model. The intern will contribute his expertise and learn from us about complex system and analytics.

INTERNSHIP 9
NETWORKS OF COLLABORATION AT WORK

Theme: Workforce of The Future

Duration: 4-6 months

Profile: Profile: Student enrolled in MSc or PhD (Computer Science or Computer Engineering).

Keywords: Social Networks Analysis concepts, basic graph theory, Linux OS, Python

Content: The way teams and team members interact to build trust, and share ideas and expertise can have a big impact on their outcomes. Having a better understanding of these interactions could play a key role into the design of systems helping individuals make connections that drive success. It could also help organizations build teams that are selected and connected to work smarter.

The intern will help apply mathematical and analytical tools and methodologies from the fields of Social Network Analysis and Complex Systems to assess the impact of social ties on productivity and careers. This will compromise implementing a number of state of the art algorithms and working on adapting/extending existing models applied to databases containing millions of interactions.