Identifying and Classifying Social Influencers - Engagement Analysis
Level: Masters
Description:

Nowadays, social networks play a huge role in influencing our society. Among the users, there are those who wield more power and influence over others. The purpose of this master thesis is to identify these individuals and also find out their area of influence.

For this task, we will choose a social network which allows api level access. Then we Crawl the network on set intervals (every hour for instance). Store this data in a **database**. Then this data will be preprocessed to make it more suitable for the task.

The network and its users will be modeled as a **graph**. Each node is a user. Each user is connected to other users through lines or arrows. Lines show no interaction, just a connection and arrows show the direction of influence. It is possible node A and node B affect each other. This translates to two arrows between them. One from A to B and one from B to A.

We will use sentiment analysis and classification to find out the type of influence and also the area of influence.

Outcome:

A system which can **identify** and **classify** influencers and their **fields of influences** on a **periodic basis** and **visualise** this information through **graphs**. This information is stored in a **database** so it can be looked up later and help **trace** the rise, fall and **evolution** of influencers.

Useful Libraries and packages:

Docker containers and docker engine (optional)
Neo4j (or some other graph database)
MongoDB

Matplotlib
pandas
Networkx
Numpy

Useful papers and resources:

https://en.wikipedia.org/wiki/Node_influence_metric
https://www.analyticsvidhya.com/blog/2020/03/using-graphs-to-identify-social-media-influencers/
https://towardsdatascience.com/tagged/graph-theory

Fairness and Ethics in AI
Level: Bachelors
Description:

Artificial intelligence (AI) has become an integral part of society and is directing various aspects of our lives from which movie we watch, where to travel and even how we should vote. As a result the implications of AI have complex social implications. It is imperative to develop techniques that are able to balance the utilities offered through AI systems with the ethical and fairness constructs in our society.

For this task, we will choose to investigate the various risks associated with AI. We need to research the existing state of the art that aims to mitigate these risks. We will explore vaiour Fair and Ethical AI techniques to identify strategies that would bring an element of Fairness, Ethics, Accountability and Transparency to AI systems.

Outcome:

A survey report about the various techniques proposed in the current scientific literatures aiming to bring Fairness to AI systems

Useful papers and resources:

https://en.wikipedia.org/wiki/Fairness_(machine_learning)
https://www.microsoft.com/en-us/research/theme/fate/
https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505651

Fintech, Digital Assets and Smart Grids
Level: Bachelors
Description:
Blockchain is an innovation for creating distributed trust between users facilitating exchange of value over a network. It can be seen as a decentralised read only database operated collectively by participants in the network. Participants in the network can be different organizations that provide computing infrastructure to maintain a single version of a decentralized ledger. Each participant locally maintains the same version of this ledger in their own environment and agrees upon any updates or changes to its state by employing some consensus algorithms. This enables trust to be distributed throughout the network, without the need for a central intermediary. The decentralisation of trust allows the blockchain technology to be transparent, secure, auditable, redundant and immutable. Since each participant maintains the same version of the truth, it removes the potential of conflict. Additionally, it also enhances the trust of end users using applications provided by organizations driven by blockchains as

they are able to get confirmation about operations on their data from multiple distinct entities rather than a single centralized party. These features of the blockchain have led to its adoption to not only in financial sectors but also in health, energy, IoT, supply chain and smart cities.

Outcome:

A survey report about the various techniques and standardization proposed in the current scientific literature, EU, IEEE that addresses the use of Blockchain technologies in the Fintech, Smart Grid and Digital Assets Management sectors.

Useful papers and resources:

https://en.wikipedia.org/wiki/Blockchain
https://ec.europa.eu/digital-single-market/en/blockchain-technologies
https://blockchain.ieee.org/
https://ec.europa.eu/digital-single-market/en/policies/ict-and-standardisation

Neuroevolution to help Reinforcement Learning Algorithms play video games better
Level: Masters
Description:
Research in the area of Evolutionary algorithms (EA) has been ongoing over the last couple of decades. However, in recent times EA applied for parameter tuning in Neural Networks rather than using gradient descent in the form of Neuroevolution have found traction. The primary reason attributed to the resurgence of EA in the form of NeuroEvolution is given to the significant increase in available computational power. Now, researchers from Google Brain Tokyo and Google Japan have proposed a novel approach that helps guide reinforcement learning (RL) agents to what's important in vision-based tasks.

For this task, you will be required to evaluate various ATARI game environments from OpenAI gym. You would be applying various Reinforcement Learning techniques for agents to autonomously play games without the need to train them on historical data. You would explore neuroevolutionary algorithms and apply them to your models to further optimize your agents to play these games better.

Outcome:

A system written in python that can play various ATARI games from OpenAI gym. Ability to fit Q and Deep Q Learning models. Ability to augment the models with neuroevolutionary techniques. You are expected to submit a high quality scientific report that explains your preliminary study on the topic, describes your experiments and its setup and finally presents the results from your experimentation.

Useful Libraries and packages:

Docker containers and docker engine (optional)
Pytorch
OpenAI Gym

Matplotlib
pandas
Numpy

Useful papers and resources:

https://en.wikipedia.org/wiki/Neuroevolution
https://openai.com/blog/emergent-tool-use/
https://syncedreview.com/2020/03/23/google-introduces-neuroevolution-for-self-interpretable-agents/
https://evolutionnews.org/2020/07/neuroevolution-methods-show-significant-success/