# Ahmed Medhat

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**SUMMARY**

Over the past 10 years, I have been devoted to network science and graph learning research within both academia and industry. Working as a research scientist in highly selective network science groups at Oxford and Facebook, building a data startup that today employs over 100 people and leading diverse teams of research scientists and engineers. I conducted and published fundamental and applied research, which, amongst other uses, has been used by the UK prime minister's office in public debates, informed how online social networks tackle misinformation and hate speech, and how NGOs such as WHO and UNHCR responded to the COVID pandemic and the Ukrainian refugee crisis, respectively. I have also built extensive experience in the end-to-end process for building predictive ML models, especially in creating algorithms and systems for ground truth generation of visual and natural language labels, and learning from weakly supervised data, through managing a large scale, multi-million dollar budget labeling project involving 100s of labelers labeling content across 10s of languages.

**RESEARCH INTERESTS**

Graph Learning, Network Science, Distributed Graph Processing Systems, Computational Social Science, Network Medicine, Network Neuroscience, Weak Supervision.

**EDUCATION**

**Oxford University**, Oxford, UK
*Master of Science*, Computer Science (Network Science) **Oct 2011**
Thesis: "A Network Modeling Approach to Assisting Collaboration in Large Scale Online Environments"
Thesis Grade: 68 (eq. 3.86 GPA)

**American University in Cairo**, Cairo, Egypt
*Bachelor of Science*, Electronics Engineering **Jun 2009**
GPA: 3.81 (*summa cum laude*)

**RESEARCH EXPERIENCE**

**Senior Research Scientist**, Network Science, *Facebook* **Dec 2021 - Present**
- Designed a bulk synchronous parallel based implementation of graph convolutional networks that scales to 10s of billions of edges.
- Built models to improve conversational health using whole graph embeddings.
- **Publication**: Studied how the friendship paradox impacts posting on social networks using network simulations. Paper under review at TheWebConf 2023.
- **Working papers**:
  - *Entropy derived supervised random walks for detecting emergence and dissolution of trends in social networks.*
  - *An overlapping community detection approach for computing multi-layer centrality.*
  - *Network resilience predictors as measures of social vulnerability during crises.*
  - *Predicting individual knowledge acquisition from social network position.*
  - *Transsortativity as a modulator of the friendship paradox & social network participation.*

**Senior Research Scientist**, Data for Social Good, *Facebook* **Dec 2020 - Dec 2021**
Data Science for Social Good is a team of scientists within the Computational Social Science Group, who are focused on leveraging Meta's mobility data to build datasets and tools to aid in natural and man-made disaster relief.
- Implemented algorithms for de-biasing geo-data derived from Facebook data to make it more representative of on-ground populations. This model was used for creating representative human co-location and population displacement maps.

- **Impact**: These datasets were used by WHO and UNHCR for crisis response to the COVID pandemic and the Ukrainian refugee crisis, respectively.

**Principal Data Scientist**, Sharing Ecosystems, *Facebook*    **Oct 2015 - Dec 2020**
Led projects that investigated drivers of content sharing behavior to motivate creation of products that fulfill their sharing needs. Specifically as related to the sharing of original, personal content.

- **2017-2020 key research project**: Ran a 3 year effort to create ground-truth data and classifiers for understanding content types across most of the world's languages. Acquired particular experience in the labeling and normalization of multi-language data, label quality improvement via active learning, and in weak supervision methods to expand training set sizes.

- **2015-2018 key research project**: Investigated what drives people to share less or more content on Facebook. This work drew on on graph learning, mass communication theory, causal inference and network experimentation, to quantify how audience size, perception biases, novelty effects and competition contribute to a person's decision to share content. Such as how the friendship paradox shapes a person's sharing rates due to perceiving their friends receiving more feedback than they actually do.

- **Other research projects**:

  - Built a model for predicting how the network structure of a community shapes its vulnerability to the spread of misinformation.

  - Built a GNN model to predict re-share cascades of misinformation content.

  - Created algorithms for performing network experiments by globally partitioning social networks to optimize for concentrated network effects.

  - Skilled in end-to-end causal inference techniques, including difference-of-differences, regression discontinuity and meta-experiment analysis.

**Chief Data Scientist**, *DueDil*                    **March 2012 - October 2015**
I built the company's data science capabilities from scratch. Helping it become one of the top Financial Startups in Europe, and growing the company to over 100 employees and clients to over a million businesses in the process. I managed two applied research teams of around 8 physics and computer science PhD grads, and data engineers.

- Led an ML team conducting applied research to create novel datasets, e.g. matching company networks to bank transaction networks using node embeddings.

- Led an analytics team that used causal inference and controlled experimentation techniques to analyze product performance and predict user preferences.

- Invented a precursor to Position Aware GNNs, that constructed node embeddings using random anchors.

- Published highly influential research on migrant entrepreneurs that went viral across the UK media, and was cited by the PM's office in political debates.

**Researcher**, *Oxford Internet Institute*                **Oct 2011 - Dec 2013**

- Utilized the Kronecker graphs network generation model to infer structural properties of wikipedia editor networks that are predictive of collective intelligence (via quality of edited output).

- Analyzed networks of wikipedia editors to answer whether the content discussing different cultural groups was produced by and representative of them, or by people not representing that culture. Utilized personalized page rank for entity disambiguation, and the louvain method and pointwise mutual information to infer editor locations and ethnicities.

**PUBLICATIONS**  **Medhat, Ahmed**, and Shankar Iyer. "The Friendship Paradox and Social Network Participation." arXiv preprint arXiv:2211.05288 (2022). *Under Review at TheWebConf 2023*

Iyer, Shankar, Brian Karrer, Daniel Citron, Farshad Kooti, Paige Maas, Zeyu Wang, Eugenia Giraudy, **Ahmed Medhat**, P. Alex Dow, and Alex Pompe. "Large-Scale Measurement of Aggregate Human Colocation Patterns for Epidemiological Modeling." medRxiv (2022). *In final revisions for the Epidemics Journal*

Graham, Mark, Bernie Hogan, Ralph Straumann, and **Ahmed Medhat**. "Uneven geographies of user-generated information: Patterns of increasing informational poverty." Annals of the Association of American Geographers 104, no. 4 (2014): 746-764.

**Medhat, A**. "A Network Modelling Approach to Ranking Collaboration in Large Scale Online Environments" (2012). Workshop on Information in Networks. New York, NY.

**PRESS COVERAGE**  *Fortune*, "Data scientists are using the most annoying feature on your phones to save lives in Ukraine", 2022.

*Facebook Research Blog*, "Making our displacement maps more representative ", 2021.

*Financial Times, Independent, Telegraph, Huffington Post, BBC + 10s of news mentions* on Contribution of Migrant Entrepreneurs to the UK Economy, March 2014

*Guardian and Huffington Post* on Wikipedia Language Maps, November 2011

**OTHER EXPERIENCE**  **Angel Investor & Venture Partner**, *Ada Ventures*  **May 2015 - Present**
I've done over 15 start-up investments and advisory engagements. Many of the founders I've supported built successful companies with 100s of employees. Through this, I formed an understanding of how machine learning research can drive the invention of new technologies that will transform healthcare, finance, the climate and beyond.

**SKILLS**  **Languages**: Fluent in Spark, R, Python, C, C++, Java, SQL/Hive
**Frameworks**: Fluent in PyTorch, TensorFlow, Hadoop/MapReduce