Coen D. Needell

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Education

2019 – 2021 **Master of Arts in Computational Social Science**, *University of Chicago*, Chicago, IL, GPA: 3.80
Thesis on Deep Learning and Human Memory.

2015 – 2019 **Bachelor of Arts in Economics and Physics**, *Washington University in St. Louis*, St. Louis, MO, GPA: 3.41
Minor in the Philosophy of Science

Experience

2023 – **Freelance Researcher**, *University of Chicago, Department of Psychology*, Chicago, IL
Built apparatus for data gathering on older adults and people with mild cognitive impairments with David Gallo. Developing a novel approach using deep learning for estimating auditory memorability with Wilma A. Bainbridge.

2022 – **Predoctoral Researcher**, *Computational Social Science, University of Pennsylvania*, Philadelphia, PA
Researched topics relating to the News, especially how the apparent "Speed of News" has been increasing. Developed the *Living Journal Toolkit*, a collection of tools for publishing live updating dashboards associated with papers, blog posts using a novel statistical and visualization package, and interactive papers. Developed the *News Observatory*, a system for monitoring news websites and collecting analyzable data about their publication behavior.

2021 – 2022 **Predoctoral Researcher**, *Microsoft Research Lab – New York City*, New York, NY
Researched topics related to the News, such as how events are framed by different publishers, the length of the news cycle, and people's perceptions of factualness. Researched the process of conversion due to advertising. Teaching assistant for the MSR NYC Data Science Summer School.

2020 – 2021 **Research Assistant**, *University of Chicago: Brain Bridge Lab*, Chicago, IL
Researched the efficacy of deep learning techniques to estimate the probability that a subject will remember an image. Used these models to create a better understanding of the features of an image that are common among highly memorable images. Developed *ResMem*, a novel deep-learning based model to estimate the memorability of images. With Prof. Wilma A. Bainbridge.

2020 – 2021 **Research Assistant**, *University of Chicago: Memory Lab*, Chicago, IL
Developed an online experiment to generate pilot data for the development of a computer assisted testing program for cognitive decline. Built in JSPsych and tested on prolific and a selection of older adults through a partnership with Rush University, the experiment is designed to see if sufficient information about one's cognitive state can be extracted with a minimal amount of memory and cognitive tests in a number of domains. With Prof. David Gallo.

2019 **Freelance Data Scientist**, *Upwork*, St. Louis, MO and Chicago, IL
Offered freelance data analysis services to companies. Projects include building systems for automatic time-series analysis, data visualization and analysis, natural language processing analysis of surveys, and consulting on larger projects. **Jobs Include:**
- Interviewing Potential Full-Time Data Scientists
- Building Statistical Learning Tools
- Natural Language Processing Analysis
- Machine Learning Development and Deployment

2018 **Programmer/Data Scientist (Internship)**, *Washington University in St. Louis: Alumni and Development*, St. Louis, MO
Continued development of previous non-scientific automation. Created new data models for donor identification. Other data analysis and visualization projects.

2017 **Real Estate Analyst (Internship)**, *Kairos Investment Management*, Rancho Santa Margarita, CA
Wrote automation programs for data processing, and constructed a model for optimal rent estimation. Built data mining programs for continued use by analysts.

2016 – 2017 **Economics Simulation Programmer**, *Washington University in St. Louis: Department of Economics*, St. Louis, MO

Built macroeconomic simulations for teaching of Economics 4121. Wrote simulations in Mathematica for the ISLMFE model, the Solow-Swan model, and permutations thereof.

Peer Reviewer, *Scientific Reports*

Deep learning for cognitive neuroscience applications.

Selected Projects

2023 – **ResMemVox**

Using deep learning techniques to estimate the memorability of audio snippets.

2022 – **News Observatory**

Using cloud computing, optical character recognition, networking techniques, and other mixed methods to create an ongoing dataset of news website publications.

2022 – **Living Journal**

Using Hugo, D3.JS and JQuery to create a framework for fast publication of interactive and live-updating social scientific analyses.

2021 – 2022 **Conversion Journeys**

Using natural language processing techniques on behavioral data to examine how consumers are converted to purchasing particular durable goods.

2021 – 2022 **Project Ratio: Framing**

A project in collaboration with Project Ratio: examining how we perceive modern news media.

2021 – **Speed of News**

Using data from the wayback machine and archive.org, this is a project focused on examining how major publishers publication behavior has changed over time. This is especially focused on the concept of the 24-hour news cycle, and how internet news delivery differs from print media.

2021 **High Speed Gammatone Cepstral Decomposition**

Connected to Ongaku, an implementation of the gammatone cepstral decomposition for OpenCL. This would allow it's use in real time applications or large scale machine learning pipelines.

2020 – 2021 **Deep Learning and Computer Vision for Memorability**

A project to create a better computer vision model for predicting the memorability of an image. This started with investigating the current standard MemNet, and has moved beyond into developing new models including the now completed *ResMem*.

2020 **Computational Rupahistory**

An ongoing side project to see how agent based simulations of territory-controlling groups interact in a simulated world. Currently on the back-burner, though some progress has been made in creating a cellular automata to generate a world map on a hex-grid.

2020 **Bandcamp Album Covers**

A project to investigate how indie musicians use visual signs to indicate their subgenre. Leverages Natural Language Processing techniques like Latent Dirichlet Allocation to analyze color usage in album cover images.

2019 – 2020 **Ongaku**

A system for creating musical playlists based on feature analysis. Leverages gammatone cepstral coefficients (a system for mimicking neural signals from the ear to the brain) and manifold learning techniques to create a psuedo-euclidean space for musical tracks. Shapes in the song-space can then be drawn to define playlists.

2019 **Fluxx for Robots**

An Artifical Intelligence Learning environment for the tabletop card-game Fluxx by Looney Labs. Has both a human-motivated interface and a machine-motivated interface. Intended for research on machine learning methods for complex and incomplete-information games.

Publications

2023 **Mainstream Media Producing and Distributing Misinformation Through Stenography and "Opinions"**,

David Rothschild, Elliot E. Pickens, Tin Orešković, Katelyn Morrison, Markus Mobius, Coen D. Needell, Jared Katzman, Duncan J. Watts

Forthcoming

2023 **Modeling Framing in News Coverage about the U.S. Economy**,

Maria Leonor Pacheco, Coen D. Needell, Elliot E. Pickens, David Rothschild

Forthcoming

2023 **The News Observatory: A collection and Storage System for Past and Future News Media Content**, Coen D. Needell, Elliot E. Pickens, David Rothschild
Forthcoming

2023 **Search Conversion Journeys and Efficient Advertising Opportunities**, Coen D. Needell, David Rothschild, *Marketing Science*
Submitted

2021 **Embracing New Techniques in Deep Learning for Estimating Image Memorability**, Coen D. Needell, Wilma A. Bainbridge, *Computational Brain & Behavior*
Published

Presentations

2023 **The News Observatory: A collection and Storage System for Past and Future News Media Content**, Coen D. Needell, Elliot E. Pickens, David Rothschild, Duncan J. Watts, *International Conference on Computational Social Science*
Poster

2021 **Memorability: A Stimulus-Centric Framework for Analyzing Memory Performance**, Wilma A. Bainbridge, Paige Hanson, Max Kramer, Coen D. Needell, Xinyue Li, *Interdisciplinary Graduate Conference, UChicago*
Panel

2021 **Embracing New Techniques in Deep Learning for Predicting Image Memorability**, Coen D. Needell, Wilma A. Bainbridge, *Annual Meeting of the Vision Sciences Society*
Poster

Skills

Machine Learning	Natural Language Processing	Data Mining
Network Analysis	Statistics and Statistical Learning	Deep Learning
Cloud Computing	Web Development	Unix
Data Visualization	Data Scraping	Philosophy of Science
Econometric Models	Systems Analysis	Advanced Mathematics

Languages, Packages, and Frameworks

Python	JavaScript	Julia
R	Stata	Mathematica
NLTK	PyTorch	Sci-kit Learn
SciPy	Numpy	Pandas
D3.js	MatPlotLib	ggplot2
Linux	Rust	OpenCL
SQL	AWS	Kubernetes