Daniel Dopp

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Profile

4^{th} year Computer Science and Computer Engineering undergraduate. Research interests center around the application of computation and AI toward scientific discovery, artistic expression, and social good.

Education

University of Kentucky **Lexington, KY**

Dual Degree: B.S. in Computer Science and B.S. in Computer Engineering Expected Graduation: May 2020

- Minors: Mathematics, Cognitive Science
- GPA: 4.00 / 4.00 – Dean's List All Semesters
- Special Programs:
  - Lewis Honors College member, Chellgren Student Fellow, International Student at Maynooth University

Research

Hacking Materials Group **Lawrence Berkeley National Laboratory**

Tools for Reproducible and Interpretable ML in Materials Science September 2018 – December 2018

- Overhauled the dataset management system of the matminer materials data mining Python package, resulting in a decrease in package size by over 90% and the addition of over two dozen datasets to the package. Done to make materials datasets available to the computational materials science community in the hope of establishing benchmarks for comparing models and feature extraction methods currently under investigation in the field.
- Integrated model interpretation algorithms into a Python package being developed for materials science focused automated machine learning pipeline generation. These algorithms were incorporated to allow non-experts to better understand the models generated by this package and trust the machine learning tools used in their work.
- Work culminated in a poster presented at a session open to Berkeley Lab staff and researchers. Developed code was integrated into production Python packages open to and actively used by the materials science community. A paper covering the automated machine learning package and integrated interpretation algorithms is currently in production.

MIT Haystack Observatory **Massachusetts Institute of Technology**

Analysis of Algorithms for Signal Direction of Arrival (DoA) Estimation June 2018 – August 2018

- Purpose was to implement and analyze algorithms for estimating the direction of arrival of signals sensed by an electromagnetic vector-sensor. These algorithms allow traditional sensor arrays to be replaced by smaller instruments in space and weight sensitive applications such as satellites and hand-held equipment.
- Wrote a Python package implementing DoA estimation algorithms for easy integration into data processing pipelines used at Haystack Observatory; then conducted extensive tests using synthetic data to measure algorithm performance based on number of signal sources, source locations, and angular resolution of measurements.
- Investigated ways of improving current algorithms using machine learning techniques and sparcity enforcing regularization methods. Project culminated in an internal research report and a talk given to Haystack Observatory staff discussing results and future directions.

Computational Research in Games and AI Lab **University of Kentucky**

Image Retrieval Using Pixel-level Image Queries January 2018 – May 2018

- Developed a database querying system that retrieves images of world landmarks by using only the pixel data of a target query image; the system was created to compete in the Google Landmark Retrieval Kaggle Challenge.
- Used tensorflow and the InceptionV3 image classifier to perform feature learning and space-partitioning data structures to efficiently partition and search across the learned features. System resulted in a best mean average precision of 0.115, corresponding to a roughly one in ten accuracy of retrieved images.

Exploratory Review of Music Genre Classification Methods August 2017 – December 2017

- Performed literature review of challenges, datasets, models, and feature representation methods currently being explored in music genre classification. Culminated in literature review paper for departmental independent study; work was done in preparation for future work in genre classification, musical style transfer, or music generation.

Kahanda Lab at Gianforte School of Computing **Montana State University**

Biomedical Document Classification for Database Curation June 2017 – October 2017

- Project purpose was to assist biomedical document database maintainers in performing triage of new documents.
- Worked to develop a classification pipeline which ranks medical texts based on relevance to Kinase research.
- Used natural language processing techniques and the Scikit-learn machine learning toolkit to process, classify, and rank over 4.4 million biomedical research documents.
- Pipeline performance exceeded the then-current state of the art and was competitive with other entries of the BioCreative VI Kinase Curation track, which resulted in presentation at the BioCreative VI workshop as well as publication in the workshop proceedings and the journal *Database*.

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Selected Publications and Posters

- Daniel Dopp, Anubhav Jain; Tools for Enabling Reproducible and Interpretable Machine Learning in Materials Science; Poster session presented at: Science Undergraduate Laboratory Internship Poster Session; December 6th, 2018; Berkeley, CA
- Julien Gobeill, Pascale Gaudet, Daniel Dopp, Adam Morrone, Indika Kahanda, Yi-Yu Hsu, Chih-Hsuan Wei, Zhiyong Lu, Patrick Ruch; Overview of the BioCreative VI text-mining services for Kinome Curation Track, Database, Volume 2018, 1 January 2018, bay104, https://doi.org/10.1093/database/bay104
- Daniel Dopp, Adam Morrone, Indika Kahanda; KinDER: A Biocuration Tool for Extracting Kinase Knowledge from Biomedical Literature, Proceedings of the BioCreative VI Workshop, 51-55, 2017

Teaching Experience

Department of Computer Science **University of Kentucky**
Lab Teaching Assistant: Intro to Computer Programming August 2017 – May 2018

- Responsible for helping run weekly student lab sessions of up to 25 students, assisting students in personal office hours, grading coursework, and participating in course planning meetings to evaluate course and student progress.

Office of Transformative Learning **University of Kentucky**
Calculus 1 & 2 Undergraduate Peer Tutor January 2017 – May 2017

- Worked with students in one on one and group settings to broaden student understanding of elementary calculus.
- Utilized the Socratic Method to encourage student to grow academically and learn independently.

Student Involvement & Leadership

Institute for Electrical and Electronics Engineers
Student Branch Treasurer August 2016 – May 2018

- Responsible for management and promotion of IEEE parts store and handling of branch funds.
- Managed the sale of parts kits to four Electrical Engineering courses totaling over 200 students each semester.
- Planned and participated in student outreach activities, branch programs, and officer meetings.
- Attended branch officer training workshops and events at IEEE SoutheastCon 2017 and 2018.
- Second place winner at the Southeastcon 2018 Student Programming Competition.

Association for Computing Machinery
Student Chapter Member August 2015 – Present

- Member of chapter competitive programming team, placed fourth at site in 2017 ICPC Regionals.
- Participated in branch community building activities and planning meetings.
- Co-hosted introductory Python programming workshop.
- Participated in yearly branch events such as CatHacks, Kentucky's largest national hackathon.

Technical Skills

- Programming Languages: Python, C++, C, R, Verilog, Bash
- Platforms: Windows, Linux/UNIX, Arduino
- Tools: Microsoft Visual Studio, PyCharm, Git, Vim, LaTeX
- Frameworks/Libraries: SciPy Stack, Scikit-learn, PyTorch, Keras, TensorFlow, Make, GDB

Honors and Awards

- Voted by peers as the College of Engineering Outstanding Computer Engineering Junior
- University of Kentucky Presidential Scholar (4 year full tuition scholarship)
- Modern Woodmen of America Regional Scholar
- Awardee of Kentucky Council for Postsecondary Education IdeaFest Travel Fellowship
- Awardee of BioCreative VI Workshop Travel Fellowship
- Member of Tau Beta Pi and Phi Kappa Phi Honor Societies