JONATHAN KING

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Education

Carnegie Mellon - University of Pittsburgh *Expected 2022*
Joint PhD Program in Computational Biology

University of California, Berkeley *May 2017*
B.A. Computer Science, B.S. Bioengineering

Skills and Coursework

- Python, Tensorflow, Keras, Pytorch, Spark, C, Java, SQL, R, Docker
- Deep Learning, Scalable Machine Learning, Neural Machine Translation
- Algorithms for Computational Biology
- Discrete Math, Probability, Linear Algebra, Operating Systems, Databases, Networks
- Biophysical Chemistry, Molecular & Systems Biology

Research Experience

Graduate Student Researcher *Aug 2017 - Present*
Carnegie Mellon - University of Pittsburgh *Advisor: David Koes*

- Developed novel and large-scale machine learning methods for protein structure prediction using generative & attention-based sequence models (Recurrent Neural Networks, Transformers).
- Explored analogous methods in RNA structure prediction, sequence generation, & property prediction.
- Identified structure activity relationships inhibitors of CYP4F2, an enzyme targeted for treating stroke.

Research Assistant *Dec 2016 - Aug 2017*
University of California, San Francisco *Mentor: Xiao Hu*

- Contributed to UCSF's "SuperAlarm" projects to combat alarm fatigue in hospitals with machine learning.
- Developed sequence forecasting methods to predict cardiac arrest from hospital alarms with AUROC=0.85.

Bioinformatics Intern *May 2015 - Dec 2016*
Plexxikon Inc., Berkeley, CA *Mentor: Paul Severson*

- Developed novel string-based algorithms to detect structural variants in acute myeloid leukemia patients.
- Published program on Illumina's BaseSpace cloud-computing platform with Amazon Web Services.
- Improved specificity and reporting methods of algorithms for target genes to outperform existing software.
- Engineered scripts for parallel analysis of biological experiments using Next Generation Sequencing data.

Research Assistant *Apr 2014 - Sep 2014*
University of California, Berkeley *Mentors: Assaf Zemach, Daniel Zilberman*

- Studied epigenetic role of DNA methylation in the *Arabidopsis thaliana* plant via computational analysis.
- Identified phenotypic responses of 40 previously uncharacterized chromatin remodeler protein mutants.

Other Projects

instaGAN: De Novo Food Blogging with Generative Models *Apr 2019*

- Combined Generative Adversarial Networks & Recurrent Neural Networks to generate & caption instagram-style food photos. Report with examples available on personal website.

RNA Secondary Structure Prediction via Neural Machine Translation *Apr 2018*

- Created Recurrent Neural Network method to predict RNA structure and terminator strength from sequence.
- Utilized multi-task learning to develop a shared latent space, improving the model by ~ 0.1 AUROC.

An Agent-Based Approach to Modeling Ebola Outbreak *Dec 2017*

- Modeled Ebola outbreak under spatial & temporal constraints with self-developed agent method.

Leadership

Summer Research Mentor *2018, 2019*
University of Pittsburgh, TECBio Research Experience for Undergraduates

- Acted as primary research mentor for 2 students completing graduate-level research projects in machine learning and drug discovery.
- Advised projects to completion; final work presented at university & minority student research symposiums.

Research Ethics Forum Mentor *2018, 2019*
University of Pittsburgh, TECBio Research Experience for Undergraduates

- Moderated student break-out groups in preparation for a cross-university forum on research ethics.

Leadership cont.

Tutor – Computer Science, Math, Chemistry, Physics *Dec 2014 - Present*
InstaEdu.com, Online Tutoring Service

- Coached over 40 high school and college students in STEM curriculum.
- Developed weekly lesson plans for video conferencing students.

Berkeley Biomedical Engineering Society *2013 - 2017*

- Planned monthly events for Bioengineering community including a research fair, outreach, & career events.

Publications

"DREAMing of big data and scalable machine learning: Predicting kinase binding with matrix factorization".
Koes, D., **King, J. E.**, Francoeur, P. G., Kowalczyk, A., Rajashekar, S., Chennubhotla, C.
Abstracts of Papers of the American Chemical Society (2019).

"Convolutional neural network scoring and minimization in the D3R 2017 community challenge".
Sunseri, J., **King, J. E.**, Francoeur, P. G., Koes, D.
Journal of Computational Aided Molecular Design (2018).

"Predict In-Hospital Code Blue Events using Monitor Alarms through Deep Learning Approach".
Xiao, R., **King, J. E.**, Villaroman, A., Do, D. H., Boyle, N. G., Hu, X.
IEEE Engineering in Medicine and Biology Conference (2018).

Presentations

"Exploring sequence-to-sequence learning methods for end-to-end, complete protein structure prediction"
American Chemical Society National Conference, Computational Chemistry Division *Aug 2019*
Canadian Chemistry Conference, Machine Learning Division *Jun 2019*
University of Pittsburgh Advanced Research in Computing Symposium *Mar 2019*

"A Novel Algorithm for Detecting FLT3 Internal Tandem Duplications in Acute Myeloid Leukemia Patients"
Northern California Computational Biology Student Symposium *Oct 2016*

Presentations (Advised)

"Screening and Simulating Potential Inhibitors for the CYP4F2 Enzyme"
Presenter: Jackelyne Garcia Cruz
Annual Biomedical Research Conference for Minority Students *Nov 2019*
Summer Undergraduate Research Symposium, Duquesne University *Jul 2019*

"Developing a Latent Space Representation for Prediction of both RNA Terminator Strength and Structure"
Presenter: Alex Ludwig
Summer Undergraduate Research Symposium, Duquesne University *Jul 2018*

Awards

Natl. Inst. of Biomed. Imaging and Bioeng. T32 Training Grant *Sep 2019 - Sep 2020*
Stipend, tuition, and travel awards.

Biomedical Graduate Student Association, Travel Award *Aug 2019*

Google Cloud Platform Research Credits, $1000 award *Jun 2019*

Best Talk, Northern California Computational Biology Student Symposium *Oct 2016*