

David Fan

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Education

Princeton University

B.S.E IN COMPUTER SCIENCE

MINOR IN STATISTICS AND MACHINE LEARNING

Sept. 2015 - June 2019

Magna Cum Laude (High Honors)

- *Thesis Advisor:* Prof. Jia Deng
- *Select Courses:* Graduate Computer Vision, Machine Learning, Optimization, Probability and Stochastic Systems, Theory of Algorithms, Algorithmic Game Theory, Information Security, Functional Programming

Publications

PEER-REVIEWED

1. Shixing Chen, Xiaohan Nie*, **David Fan***, Dongqing Zhang, Vimal Bhat, Raffay Hamid. Shot Contrastive Self-Supervised Learning for Scene Boundary Detection. *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2021.
2. Weifeng Chen, Shengyi Qian, **David Fan**, Noriyuki Kojima, Max Hamilton, Jia Deng. OASIS: A Large-Scale Dataset for Single Image 3D in the Wild. *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, 2020.
3. Zachary A Kopp, Jo-Lin Hsieh, ..., **David Fan**, ..., Yongkyu Park. Heart-specific Rpd3 Downregulation Enhances Cardiac Function and Longevity. *Aging*, 2015.
4. Shi-Zeng Lin, Xueyun Wang, ..., **David Fan**, ..., Sang-Wook Cheong. Topological defects as relics of emergent continuous symmetry and Higgs condensation of disorder in ferroelectrics. *Nature Physics*, 2014.

UNDER REVIEW

1. **David Fan**, Deyu Yang, Xinyu Li, Vimal Bhat. Nearest-Neighbor Contrastive Learning from Unlabeled Videos. *Under review*.

PREPRINT

1. Jean Fan, **David Fan**, Kamil Slowikowski, Nils Gehlenborg, Peter Kharchenko. UBiT2: a client-side web-application for gene expression data analysis. *bioRxiv doi:10.1101/118992*, 2017.

* = equal contribution.

Research / Work Experience

Amazon

Seattle, WA

APPLIED SCIENTIST

July 2020 - current

- Developed self-supervised method for scene boundary detection that improves state-of-the-art by 13% while reducing data labeling requirements by 75% and improving inference time by 84%. **Second-author paper** accepted to CVPR 2021. **Blog post** on Amazon Research website.
- Developed novel self-supervised video representation learning method that improves state-of-the-art in video action recognition. Mentored research intern to full-time offer. Paper is under review.
- Explored audiovisual contrastive learning and vision transformers for video action recognition and cinematic content understanding.

Amazon Web Services

Seattle, WA

SOFTWARE ENGINEER

Aug. 2019 - July 2020

- Added logging metrics and launched canaries to support new EC2 G4 instance family based accelerators.
- Launched Elastic Inference-enabled PyTorch (**blog post**) for SageMaker, EC2, ECS.
- Implemented TorchScript graph validation, shipped updated AWS Deep Learning Conda environments and Docker containers, benchmarked performance, wrote blog post.
- Created proof-of-concept for building and integrating TensorRT-enabled TensorFlow 2.1 into the inference engine. Reduced latency by up to 70% compared to FP32 native TensorFlow in benchmarks.

Princeton Vision and Learning Lab (Prof. Jia Deng)

Princeton, NJ

UNDERGRADUATE RESEARCHER

Sept. 2018 - July 2019

- Created OASIS, which is the first dataset for single-image 3D vision in the wild with dense annotations of detailed 3D geometry at scale. Dataset improves performance in multiple single-image 3D tasks.
- Implemented novel pipeline for crowdsourcing dense pixel-wise 3D ground truths from sparse annotations, and quality control mechanisms.
- Trained state-of-art deep learning models to benchmark dataset for monocular surface normal estimation and planar semantic segmentation, and evaluate cross-dataset generalization. Provided baseline for fold and occlusion boundary detection.
- **Paper** accepted to CVPR 2020.

Amazon Web Services

East Palo Alto, CA

SOFTWARE ENGINEERING INTERN

June 2018 - Aug. 2018

- Developed automated devops tool for AWS Aurora — a distributed cloud-native relational database service — which improved on-call engineer productivity by automatically applying fixes to low-severity tickets and reducing manual processes.
- Wrote tool for applying autoscaling policies and provisioning IOPS for DynamoDB clusters to improve cost management.

Phosphorus

New York, NY

SOFTWARE ENGINEERING INTERN

May 2017 - Aug. 2017

- Redesigned and implemented custom UI/UX components for user dashboard using Wicket and Scala.
- Designed modeling layer in Scala, Spring Boot, Hibernate, and PostgreSQL. Wrote AWS CloudFormation templates for automated infrastructure deployment.

Harvard-MIT HST (Biomedical Informatics)

Boston, MA

RESEARCH INTERN

June 2016 - Aug. 2016

- Developed web app for visualizing geographic trends in AETNA insurance and US Census data using R Shiny and MySQL. Mentored by Prof. Isaac Kohane and Prof. Arjun Manrai.
- Contributed to **ubit2.com**, an open-source client-side web application for bioinformatic analyses. **Technical report** on bioRxiv.

Leadership

HackPrinceton

Princeton, NJ

DIRECTOR

Sept. 2016 - Apr. 2018

- Princeton's biannual hackathon hosts 1,100 students from around the world each year. Led 30 organizers and raised \$130,000 in funding as head director of HackPrinceton Fall 2017 and Spring 2018.
- Organized logistics and hacker experience for Fall 2016 and Spring 2017.
- Past website: <https://f17.hackprinceton.com>

Princeton University Science Olympiad

Princeton, NJ

CO-FOUNDER

Sept. 2016 - Feb. 2019

- 800 of the USA's top high school students compete at the annual Princeton University Science Olympiad invitational tournament.
- Founded organization in 2016 and directed a team of 10 organizers + 100 volunteers to run the inaugural tournament. Coordinated 23 competition events and over 100 student volunteers.
- In February 2018, became first tournament nationwide to waive registration fees and release all tests, improving accessibility for underresourced groups.
- Created website and organizational presence: <https://scioly.princeton.edu>

Princeton University Math Competition

Princeton, NJ

LOGISTICS DIRECTOR

Sept. 2016 - Nov. 2016

- Directed logistics for one of the nation's premier high school math competitions.

Select Software Projects

Single-Image Normal Estimation 2018

- Implemented hourglass network architecture from NeurIPS 2016 paper and trained on internal dataset for Princeton competition. Used data augmentations and learning rate scheduling to win 1st place.
- Code: <https://github.com/dfan/single-image-surface-normal-estimation>

TigerTexts 2018

- Web app that consolidates Princeton student coursebook pricing information from multiple sources and offers third-party seller platform. Uses the MERN (MongoDB, Express, React.js, Node.js) stack.
- Documentation and technical report: <https://tigertexts.herokuapp.com/about>
- Code: <https://github.com/rfblue2/tigertexts>

UBiT2 2016

- Lightweight client-side web app for visualization + analysis of RNA-seq + qPCR data. All computation is client-side enabling greater accessibility for researchers without programming background. No setup required.
- Link: ubit2.com | Code: <https://github.com/JEFWorks/ubit2>

Honors & Awards

Kaggle Bronze Medal (Google Open Images – Object Detection)	2019
Sigma Xi Award for Outstanding Undergraduate Research, Princeton University	2019
Class of 1901 Medal Finalist, Princeton University	2019
<i>Graduating senior who has done the most for Princeton University.</i>	2016
Princeton Innovation Magazine 25 under 25	2016
Intel Science Talent Search Semifinalist	2015

Talks

BUILDING CV MODELS WITH LIMITED LABELED TRAINING DATA

- Amazon Research (March 2021)

3D SURFACES IN THE WILD

- Princeton Research Day (May 2019)
- Princeton Computer Science Independent Work Poster Session (May 2019)

VISUALIZING GEOGRAPHIC TRENDS IN INSURANCE CLAIMS DATA

- Harvard Medical School DBMI Summer Symposium (July 2016)

Skills

Programming Languages	Python, Java, R, Javascript, Go, OCaml, MatLab, C/C++
Libraries	PyTorch, TorchScript, TensorFlow, OpenCV, Shiny
Web Development	Django, Express.js HTML5, React, Hugo, Jekyll
Databases	MySQL, MongoDB, DynamoDB
Other	AWS, Docker, Git, UNIX, LaTeX, Leadership