

David Montague

Passionate about machine learning, augmented reality, and outcome-driven development

Experience

Exactrics, Inc. • Founder & CTO • Jul 2018 – Dec 2019

Exactrics lets you scan clothes with your phone, then search, filter, and compare by fit while shopping online

- Built a pipeline for converting sets of smartphone photos into millimeter-precision clothing scans
- Built custom fit-search, look-search, and fit-comparison engines for use with our scan data
- Built and maintained our backend server and cloud deployment infrastructure
- Collaborated on the frontend, including development of client SDKs and custom data visualizations

Palantir Technologies • Member of the Technical Staff • Oct 2015 – Feb 2018

- Adapted modern math, stats, and CS techniques to build solutions for Palantir's most critical customers and product teams. Selected projects include:
 - A personalized document feed used by intelligence analysts to surface urgent new reports
 - A viewership model used by a TV network to simulate and optimize promotional campaigns
 - A customer churn model used by a major payment processor to prioritize CRM efforts

Education

- **Stanford University** • PhD, Mathematics • MS, Statistics • 2012 – 2017
 - Thesis: **Covariance estimation and graphical models for infinite collections of random variables**
- **Cambridge University** • MAST, Mathematics • Churchill Scholarship • 2011 – 2012
- **University of Michigan – Ann Arbor** • BS, Mathematics • 2007 – 2011

Selected Projects

Clothing Fit Scan Pipeline (Exactrics)

- Reconstructed multiple surface views with traditional photogrammetry techniques
- Used output masks from CV models to stitch reconstructions into clothing item surface
 - Used a custom U-Net to precisely segment clothing from background in each view
 - Handled non-rigid deformations with a Siamese CNN to identify surface correspondences
- Computed geodesic-based clothing surface vectorizations for fit-based search and recommendation

Intelligence Document Recommendation Engine (Palantir)

- Vectorized documents using various domain-specific features:
 - Custom word vectors built from domain corpus
 - Sparse named entity features (using domain-specific NER refinements)
 - Geographic features from a hidden layer of an auxiliary network with lat/lon inputs
- Combined document vectors with user interaction data to build user profile vectors
- Recommended new documents by predicting interaction from (user, document) vector pairs

Skills

Machine Learning and Data Science

- Have deployed models in numerous domains:

- TV advertising, drug discovery, fraud detection, remote sensing, O&G predictive maintenance, etc.
- Experienced with various forms of unstructured data: images, audio, time-series, text, etc.
- Experienced writing data processing pipelines of various complexities and sizes (up to terabyte-scale)
- Experienced with out-of-core techniques for “big” data, and optimal inference techniques for “small” data

Computer Vision and Augmented Reality

- Have used CNNs, U-Nets, and custom neural nets to automate various image-processing tasks
- Extensive experience using `scikit-image` and `OpenCV` for 2D image pre-processing and manipulation
- Have used `OpenCV`, `Open3D`, `AliceVision`, `CGAL`, etc., to solve various 3D mesh geometry problems
- Experienced working with raw RGB-D data from Intel RealSense cameras and dual-camera phones
- Understand the capabilities and limitations of the high-level mobile AR toolkits (ARKit and ARCore)

High-Performance Python

- Deeply familiar with scientific python, including `numpy`, `scipy`, `matplotlib`, `pandas`, `scikit-learn`, etc.
- Experienced using Cython and C++/PyBind11 to write various high-performance extensions
- Experienced orchestrating streaming processing jobs on non-server nodes with `celery`
- Experienced using Apache Spark to perform large-scale analytics jobs on a dedicated cluster

Web APIs, Frontend, and DevOps

- Experienced designing, developing, and deploying APIs for web and mobile front-ends
- Extensive experience with python’s ASGI server ecosystem
 - Have contributed to `pydantic`, `fastapi`, `starlette`, and more
- Experienced with frontend frameworks: React and Vue on the web; UIKit and SwiftUI on iOS
- Familiar with typical infrastructure requirements and security concerns for public-facing web services
- Experienced using Docker to develop and deploy containerized web services to multiple cloud providers

Agile Development

- At Palantir, used scrum to establish a reputation of consistently delivering high-quality results on time
- Understand the importance of communication; high-frequency iteration with stakeholders is a top priority
- Methodical about formulating, testing, and confirming/rejecting business hypotheses

Articles and Publications

- Machine Learning
 - [Algorithmic Trading of Futures via Machine Learning](#) (Stanford CS229 Project)
- Math
 - [Graphical Markov Models for Infinitely Many Variables](#)
 - [5 other mathematics papers](#)

Open Source Projects

- [FastAPI](#) • *Collaborator on GitHub*
- [Pydantic](#) • *Collaborator on GitHub*
- [FastAPI Utils](#) • *Owner on GitHub*
- [FastAPI Client](#) • *Owner on GitHub*
- [setuptools-cpp](#) • *Owner on GitHub*