

# DAVID KARAPETYAN

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<http://davidkarapetyan.com>

## EXPERIENCE

### Head Data Scientist

Rudin Management  
New York City, NY

June 2015–Present

- Designed and implemented a **machine learning forecasting and analytics engine** for energy usage in commercial and non-commercial buildings for Rudin Management, a leading real estate developer in NYC.
- Using weather and other proprietary covariates, engine forecasts: optimal building startup time, ramp-down time, lunch startup time, lunch rampdown time, daily building steam usage, daily electricity usage, occupancy, and others.
- Greatly improved upon building predictions made by a team of Columbia University Ph.D and masters degree statisticians (a three year project that was ultimately abandoned) based upon a number of different metrics, including: cross-validation accuracy, random forest out-of-bag scores, mean and variance of residuals, max/min residuals, and others.
- Implementation uses **parallel programming in Python**, with modules including **scikit-learn**, **pandas**, **matplotlib**, **statsmodels** and **numpy**. Data is stored in and read from **SQL**, **MongoDB**, and **HDF5**.
- Models used for the forecasting include **Random Forests**, **Gradient Boosted Trees**, **ARIMA(X)**, **SARIMA(X)**, and **SVM**.

### Quantitative Analyst

Ernst & Young  
New York City, NY

June 2014–June 2015

- Developed Class Model forecasting module in **R**. Used **ARIMA regression on macroeconomic scenarios** (base, adverse, or severely adverse) and position data to forecast and plot any input banks PPNR, Provision, Capital and other variables with respect to time.
- Provide valuation and advanced financial modeling expertise to institutional clients in regards to complex securities including equity and foreign exchange options, rates swaptions, and related embedded derivative instruments.
- Used **Monte Carlo and Finite Difference** to determine fair value of client instruments for accounting purposes.
- Designed and performed **stress-tests** for investment bank clients pricing models for **CCAR** purposes. Evaluated the impact on **PV and option Greeks** of clients portfolio of equity and foreign exchange exotic instruments under severely adverse market scenarios.
- Provide data analysis of trade desk definitions and descriptions, and report anomalies to client. Trades included **forex USD and G10 pairs**, **G10 and emerging market pairs**, **trades with long and short expiry**, **Asian options**, **barriers**, and a variety of others.

### Visiting Assistant Professor

University of Rochester  
Rochester, NY

July 2012–July 2014

- Researcher of partial differential equations, in particular nonlinear evolution equations.
- Publications list with doctoral thesis at <http://davidkarapetyan.com/pdfs/publications.pdf>
- Developed **numerical simulations in C++** to gain intuition about whether certain equations are well-posed or ill-posed for rough initial data.
- Taught courses on Numerical Analysis, Calculus, Topology, Applied Mathematics, Linear Algebra, Differential Equations, and Financial Mathematics.

### Research Associate

Institute for Defense Analyses  
Alexandria, VA

Aug 2004–Aug 2005

- Conducted research for Pentagon sponsored and privately sponsored projects.
- Applied ***k*-Nearest Neighbor regression** to analyze existing data on high occupancy toll lanes in the Los Angeles, San Diego, and Chicago metro areas.

## EDUCATION

### University of Notre Dame

- **Ph.D.**, Mathematics

Aug 2007–May 2012

Thesis: *On the well-posedness of the hyperelastic rod equation*

- Awarded the **Schmitt Presidential Fellowship**. Full scholarship.

### University of California, Berkeley

- **B.S.**, Mathematics and **B.A.**, English Literature.

Aug 2000–May 2004

- Awarded the **Regents Scholarship**. Full scholarship.

- Nominee for ND Shaheen Graduate School Award for top student.

## TECHNICAL SKILLS

- Languages: Python (full SciPy stack, Flask), Scala, R, C/C++, HTML5, Bash, L<sup>A</sup>T<sub>E</sub>X.
- Operating Systems: Unix (Debian/Ubuntu, FreeBSD, OS X) , Windows (XP, Vista, 7)

## HONORS, AWARDS, AND EXTRACURRICULAR ACTIVITIES

- Chess Expert [http://www.chessdryad.com/articles/mi/article\\_165.htm](http://www.chessdryad.com/articles/mi/article_165.htm)