# Colin K. Curtis - Software Engineer

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## Major Achievements

- **Developer** - Current team member in the development of an automotive-industry, production-ready CAD system
- **Lead Developer** - Adaptive Learning Analysis for Images (ALAI), an Automated Image Analysis application
- **Developer** - Footprint Metric Analysis Tool (FMAT) - Conversion and upgrade from MATLAB to Python
- **Project Manager and Author** - 'Friction: Friend and Foe', book chapter in Surface and Interface Science Vol. 8

## Work Experience

### Senior Software Engineer - EASi; *April 2019 - Present*

- Working with a team of software engineers and material scientists on an in-house CAD system for an industry-leading automotive company. The system is written with Python3 and React.js.
- Strong focus on effective and empathetic communication with a globally distributed team
- Consistent coverage using unittest coverage for both Python3 and React.js code
- Converted and upgraded FMAT, a tire image analysis tool, from MATLAB to Python3 - introduced 'alpha-shapes' computational geometry technique to improve the estimates of complex 2-D geometries
- Agile style development with two-week sprint timelines, daily stand-up meetings, and frequent code reviews

### Research Software Engineer - Renaissance Computing Institute (RENCI) @ UNC - Chapel Hill; *June 2018 - March 2019*

- NIH National Center for Advancing Translational Sciences (NCATS) - Biomedical Data Translator Project - Green Team
- Statistical Analysis: risk/odds ratio testing and Bayseian statistics to quantify drug performance
- Utilized Jupyter Notebooks, with Python3, to analyze data and visualize results in an interactive, shareable format
- Embedded SQL and SPARQL queries within Python to access and parse Ontologies
- Accelerated data collection from APIs through use of concurrent I/O using 'asyncio' and 'concurrent' modules
- Performance tested services for high-concurrency request loads using and 'locustio' and 'pytest'
- Worked remotely with a Computational Biologist, through Slack, to develop an algorithm for aggregating gene and tissue IDs and then finding ID co-occurrence patterns in that data (publication in planning stage)

### Research Assistant, Krim Group; *January 2015 - April 2018*

- Developed ALAI, an Automated Image Analysis application, for automating image analysis
- Primary skills: equipment building, data capture, data analysis, and mathematical modeling
- Subject-matter expertise: in carbon nano-structures, inter-facial friction
- Participated in two National Science Foundation (NSF) funded projects: DMREF and QCM
- Software packages and programming environments included Origin, LabVIEW, MATLAB, and Python 3
- See Research Publications

### Research Assistant, Clarke Group; *January 2013 - July 2014*

- Research focus: Polymers, LASER for spectroscopy and photothermal heating, nanoparticle synthesis
- Utilized ANSYS Maxwell mesh-calculation to simulate 3-D electro-magnetic fields
- Used and maintained LabVIEW software systems for instrument control and data collection

### Teaching Assistant, Department of Physics, NC State University; *August 2012 - December 2014*

- Instructor for introductory physics laboratory sections (PY 205 and PY 208)

# Independent Coding Projects

**code repository at www.github.com/colinkcurtis**

**Adaptive Learning Analysis for Images (ALAI), an Automated Image Analysis application**
- An Automated Image Analysis application utilizing custom iterative categorization and regression fitting techniques
- Written using MATLAB, an ideal tool for linear algebra and statistics over large matrices
- ALAI calculates and produces figures for: fractal dimension, saturation roughness, and correlation length
- Reduced user's active analysis time, per image, by a factor of ~50, drastically reducing labor costs
- Classification of 'fitting zones' (linear v. exponential) by $Adjusted - R^2$ comparison between multiple fitting attempts
- Weighting and bias-of-fit calculated according to uncertainties from measurements stored in file meta-data

**HackerRank Challenges**
- Project Euler 220: Heighwey Dragon
- Project Euler 217: Balanced Numbers
- Project Euler 206: Concealed Square
- Project Euler 1: Multiples of 3 and 5

# Professional Skills & Interests

**Languages & Environments**
- Python 3
- React.js (Javascript)
- MATLAB, LaTeX
- Linux, macOS, & Windows

**Software Engineering Toolkit**
- Software & Algorithm Design
- Object Oriented Programming
- Functional Programming
- tensorflow2 and keras for CPU, GPU, & TPU
- OpenCV for static image analysis
- Time/Space Complexity Analysis
- Docker, Github, & Jenkins
- Jupyter Notebooks
- RESTful & OpenAPI standards
- Jira, Confluence, Bitbucket
- VMs & Virtual Envs
- json & yml
- SPARQL, NoSQL & Graph Databases
- pytest & locustio
- networkx, obonet, & pronto
- mezos, marathon, & nginx
- Flask, swagger, & gunicorn
- pandas & numpy
- memory_profiler

**Professional Skills & Abilities**
- Expert Problem Solving
- Adaptable to Broad, Multi-disciplinary Teams of all sizes
- Statistical Data Analysis
- Image Analysis
- User Interface & Experience Design
- Strong Written, Verbal, and Quantitative Skills
- Advanced Physics Knowledge
- Mathematics for Machine Learning: Statistics, Linear Algebra, Probability and Information Theory
- Data Analysis
- Fractal Analysis

**Other Interests**
- Science Fiction, History, and Biographies
- Skiing, Running, and Mountain Biking
- Gardening and Cooking

# Education Milestones

○ **M.S. Physics**, North Carolina State University (2014)
○ **B.S. Physics, Mathematics Minor**, Appalachian State University (2012)

# Research Publications

○ First Author, *A Comparative Study of the Nanoscale and Macroscale Attributes… of Nanodiamonds*, Beilstein Journal of Nanotechnology, Sep 2017 (PDF available here: https://www.beilstein-journals.org/bjnano/content/pdf/2190-4286-8-205.pdf)

○ Second Author, *Unconfined, melt edge electrospinning from multiple, spontaneous, self-organized polymer jets*, Materials Research Express, 28 Nov 2014 (Vol. 1, Num. 4)

○ Third Author, *A Tribological Study of $\gamma$-$Fe_2O_3$ Nanoparticles in Aqueous Suspension*, Tribology Letters, Dec 2018 (66:130)