Colin K. Curtis - Software and Data Engineer

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Major Achievements

- **Developer** - Adaptive Learning Analysis for Images (ALAI), a Computer Vision software package for characterization of scientific images through large-matrix linear algebra and statistical analysis
- **Developer** - 'icees-client' pip module, a pip-installable module for interfacing with clinical-data-housing ICEES API
- **Developer** - Bicluster Co-Occurence Algorithm for the RNAseqDB biclusters computed with the MAK algoirthm by Marcin Joachimiak [github.com/ncats/translator-workflows/tree/master/WorkFlow9]
- **Author** - Multiple academic publications in the Physics sub-fields of Tribology, Optics, and Polymer Science
- **Project Manager and Author** - 'Friction: Friend and Foe', book chapter in Surface and Interface Science Vol. 8
- **Organizer** - Carrboro High School AP Science Class tours of NCSU Physics ORaCEL labs and equipment
- **National Meritorious Winner (Team of 3)** - COMAPS MCM, 2011 - Radio Repeater for Network Optimization

Work Experience

Software and Data Engineer - Renaissance Computing Institute (RENCI); June 2018 - Present

- Clean, concise, readable, and modular code
- Biomedical Data Translator - Green Team member, NIH National Center for Advancing Translational Sciences (NCATS)
- Collaboration with teams spanning disciplines to answer bio-medical research questions
- Setup, improve, and maintain front- and back-end of web APIs for biomedical data access (SaaS)
- Automated the creation of biomedical web APIs based on large data sets using Jinja2 scripting for Python
- Accelerated data collection from web APIs through use of concurrent I/O (Python3 asyncio)
- Accessing and analyzing large, bioinformatic graph data sets for Rapid Hypothesis Generation
- Collaboration with diverse collaborators to stand-up novel bioinformatic services and tools
- Effective communication with persons of diverse training and background is critical for a project of this scope and scale
- Developed icees-client, now a pip module, to allow easy Python3 interface to ICEES clincal-data web API

Research Assistant, Krim Group; January 2015 - December 2018

- Research focus: data analysis, predictive modeling, functionalized carbon nano-structures, friction, surface effects
- Participated in two National Science Foundation funded projects: DMREF and QCM
- Designing Materials to Revolutionize and Engineer our Future (DMREF)
- Quartz Crystal Microbalance Studies of Atomic-Scale Friction (QCM)
- Software packages and programming environments included LabVIEW, MATLAB, and Python 3
- Central responsibilies: collection, analysis, interpretation, and presentation of scientific data
- Optimization and organization of the lab group's time and equipment
- See Research Publications for experiment-specific results

Research Assistant, Clarke Group; Jan 2013 - July 2014

- Research focus: Polymers, LASER for spectroscopy and photothermal, nanoparticle characterization and synthesis
- Designed and built a melt electro-spinning device for polymers, producing ultra-fine fibers without solvent
- Utilized ANSYS Maxwell mesh-calculation to simulate 3-D electro-magnetic fields
- Used and maintained LabVIEW software systems for instrument control and data collection
- Second Author, *Unconfined, melt edge electrospinning... polymer jets*

Teaching Assistant, Department of Physics, NC State University; August 2012 - May 2014, August 2014 - Dec 2014

- Instructor for introductory physics laboratory sections (PY 205 and PY 208)
- Provided theoretical introduction to the relevant course materials
- Organized and maintained teaching laboratory equipment
- Provided real-time feedback and assistance to students via the Socratic method

Other Coding Projects

code repository at www.github.com/colinkcurtis

Adaptive Learning Analysis for Images (ALAI), A Machine Learning Application

- Reduced user's active analysis time, per image, by a factor of 100, drastically reducing labor costs
- Data fitted using iterative categorization and regression
- Weighting and bias-of-fit automatically calculated according to uncertainties from measurements
- Classification of continuous fitting zones (linear v. exponential) by $Adjusted - R^2$ goodness of fit comparison
- The goal was to determine fractal dimension, saturation roughness, and correlation analysis from Atomic Force Microscope images
- Written in MATLAB, chosen for statistical processing large matrices and linear algebra efficiency

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

gibber

- Retrieve, filter, and record data for: market listings, account balances, and transaction records
- Retrieve data from remote financial databases via RESTful style API (Bittrex and Gemini exchanges)
- Filter data using Regular Expression methods used to filter and sort to ensure data integrity and usability
- Record data in a format of the user's choosing, including SQL, CSV, or JSON formats

Professional Skills & Interests

Languages & Environments

- Python3
- MATLAB, LaTeX
- HTML5, CSS, & JavaScript
- Linux, macOS, & Windows

Software Engineering Toolkit

- Algorithm design & SaaS
- VM, & Virtual Envs
- asyncio (concurrent I/O)
- Docker, Github, & Jenkins
- RESTful & OpenAPI
- json, yml
- pytest
- Graph databases
- pytest, networkx, obonet
- mezos, marathon, nginx
- Flask, swagger
- json
- asyncio
- networkx
- obonet & pronto
- Jinja2
- requests
- certifi
- iPython
- jupyter notebook
- pandas & numpy
- memory_profiler
- Zlib
- basic SQL queries
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Professional Skills & Abilities

- Strong Written, Verbal, and Mathematical Skills
- Adaptable to Diverse, Multi-disciplinary Teams
- Data engineering
- Fractal Analysis
- Physics Modeling
- Agile & SCRUM Development Experience
- Concurrent I/O
- Advanced Mathematics
- Parallel Programming
- User Interface Design & Documentation

Other Interests

- Conversational Spanish & Hindi
- Frankenstein, Consciousness, & AI
- Sci-Fi, History, and Biographies
- Running and Mixed Martial Arts
- Gardening and Cooking

Education Milestones

- **Ph.D. Physics**, North Carolina State University (expected 2019), Tribology of Functionalized Carbon Nano-structures
- **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)
- First Author, *Diffusion of Gaseous Ethanol and Water through Functionalized Graphene and Graphene Oxide Membranes*, Manuscript in Preparation
- First Author, *Aqueous Inter-facial Friction on Smooth and Rough Au Surfaces Mediated by Functionalized Nanodiamonds*, Manuscript in Preparation
- 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 γ-Fe$_2O_3$ Nanoparticles in Aqueous Suspension*, Tribology Letters, Dec 2018 (66:130)