Colin K. Curtis - Software and Data Engineer

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Major Achievements

- **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]
- **Project Manager and Author** - 'Friction: Friend and Foe', book chapter in Surface and Interface Science Vol. 8
- **Author** - Multiple academic publications in the Physics sub-fields of Tribology, Optics, and Polymer Science
- **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
- **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
- Paid Research Assistant for two major National Science Foundation funded projects: DMREF and QCM
- Utilized software packages and programming environments including LabVIEW, MATLAB, and Python 3
- Central responsibility was collection, analysis, interpretation, and presentation of data
- Optimization and organization of the lab group's time and equipment
- See Research Publications
- Experiments involving gaseous diffusion through functionalized graphene and graphene oxide layers, in vacuum, to study the permeability of, and friction experienced by, nanoscale carbon membranes in the presence of common gases

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 costs of image analysis by reducing the user's time-per-image by a factor of 100
- 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

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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Languages & Environments

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

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)