Nicholas Decheine - CV

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EDUCATION

University of Wisconsin - Madison *August 2016 - August 2021*
Bachelor of Science, Major in Physics, Astronomy-Physics, and Computer Science

PROJECTS

Implemented ServiceX Data Source for ROOT's RDataFrame May 2021 - August 2021
Software Engineer, Fellow *IRIS-HEP Fellowship*

- Created a C++ library called and demo program called XDataFrame to connect ServiceX physics experiment data delivery as a data source for ROOT's RDataFrame.
- Designed the architecture for the library to be used in any C++ program that uses ROOT for analysis. Project uses the build system CMake which I made to handle all external dependencies that need to be downloaded and built, so users do not need to worry about it.
- The library makes a request to ServiceX and upon completion fetches the corresponding ROOT files, then creates an RDataFrame instance with those ROOT files which is returned by the XDataFrame library call.
- Incorporated external packages for data processing and remote cURL operations such as the AWS C++ SDK, jsoncpp, and ryml for yaml files.
- See more about the project and the proposal at my Fellowship Page

Gesture Authentication Mobile Application Fall 2020
Software Developer, Scrum Master, Designer *Madison, WI*

- Worked with a small team as scrum master in my software engineering course to develop a mobile application for a psychology researcher for the University of Idaho.
- Project helps explore the efficacy of gesture-based passwords for creating ultra secure and easy to remember gesture sequences for authentication.
- Used the mobile application framework Flutter for the user-side mobile app with a PostgreSQL database for the backend.
- Developed using Android Studio and written in Dart.
- Also did the UI/UX design using Figma where I created my own libraries to use in future design projects.

RESEARCH

UW-Madison Physics Department August 2019 - January 2021
Undergraduate Researcher *Madison, WI*

- Wrote and ran simulations for Ricochet, a collaboration developing the Ricochet neutrino detector, using Geant4-based simulation software (ricochetsim) developed by a few collaboration scientists.
- Required an in-depth and low-level understanding of the Ricochet simulation software as a C++ CMake project, and building the project from source.
- Developed a software documentation site for the collaboration to use, using MkDocs for static site generation and GitLab CI/CD for hosting the site.
- For an independent study/thesis project, I designed and implemented a class data structure in C++ for modelling the detector's electronic response that interfaces with existing ricochetsim event classes, bundled in an application I called Ricochet Detector Electronic Response (RDER).

· I laid the ground work for the data structures for the simulation chain, going from Geant4 energy deposits to waveforms to electronics to digitization.

Physical Sciences Laboratory Summer 2018
Research Assistant *Stoughton, WI*

· Mass production and assembly of detector cables for the LUX-ZEPLIN dark matter experiment.
· Involved working in and maintaining an ISO 4 class clean room for assembly and cable bundling.
· Individually tasked with designing (with SOLIDWORKS) and machining an apparatus to cut various sizes of heat-shrink tubing to use for detector cable bundling and binary labelling, and an apparatus to clean nearly 2 kilometers of such cables.
· Soldering other kinds of cable connectors under clean room conditions, such as RJ45, DB25, and custom HV connectors.

UW-Madison Physics Department (SNOLAB) Spring 2018
Detector Operation Remote Shifter *Madison, WI*

· For MiniCLEAN, monitoring cryogenic detector filling, logging checklists for system operation, using web-based slow control system.

UW-Madison Physics Department May 2017 - May 2019
Simulation Programming and Analysis *Madison, WI*

· Used a C++ based simulation framework called Reactor Analysis Tool (RAT) for Monte Carlo simulations of physical events for the calibration of the MiniCLEAN dark matter experiment in order to explore the efficacy of liquid argon scintillator direct detection experiments.
· This involved writing RAT macros to run simulations with different detector conditions, geometry, and scenarios.
· Used ROOT for event analysis and pulse discrimination comparison of liquid and gaseous argon simulations.
· Presented at the UW-Madison Undergraduate Symposium in 2018 on my research regarding calibration simulations for the MiniCLEAN experiment, and showcasing the methods of pulse shape discrimination for a cryogenic liquid argon dark matter detector.
· Studied nitrogen and oxygen contamination effects on liquid noble scintillation to decide filtration priority, concluding oxygen having much larger effects on detector behavior and modelling this behavior.

EDUCATIONAL WORK

Physics Learning Center September 2019 - May 2020
Peer Mentor Tutor *Madison, WI*

· Facilitate a Learning Team twice weekly for undergraduate introductory physics courses, covering topics from kinematics to wave optics to electrostatics.
· Attend weekly training sessions on both teaching technique and the relevant physics.
· Experience with teaching and public speaking.
· Worked in partnership with a community of peers interested in developing a safe and inclusive teaching space for students as we help them learn physics.

EXPERIENCE WITH SYSTEMS, TOOLS, AND FRAMEWORKS

The following is a list of some of the various languages, tools, frameworks, etc. that I have development experience with. Ask about any of them.

C++	ROOT	Python	Many Linux Distros
Geant4	Bash	Java	Mathematica
MkDocs	GitLab CI/CD	JupyterLab	

RELEVANT EXTRA-CIRRUCULAR

Outreach officer for the University Physical Society at UW-Madison.

PERSONAL TRAITS

Highly motivated, eager to learn new things; Unbridled curiousity.

Ability to work as an individual as well as in group.

Finding lots of different and creative approaches to problems, exploring what others may overlook.