LUCAS ZEER

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SOFTWARE DEVELOPER, NANOTECH ENGINEERING (GRAD 2017)
UNIVERSITY OF WATERLOO

EXPERIENCE

THE BRAINERY (FERROBOT)
Founder
February 2018 - Present

I have been developing the FerroBot: a patent pending digital microfluidics platform based off of magnetofluidics. The FerroBot allows for much more precise and reliable drop control, while also requiring no expensive disposables or thin films. In addition to developing the hardware; I have also been building an Electron based control application. I also release weekly YouTube videos covering a range of Ferrofluid related subject matter.

SCI-BOTS
Lead Software Developer
June 2017 - May 2018

Developed software for Sci-Bots' Microfluidics platform (The DropBot) called SciCAD. SciCAD is an Electron based application based on a custom MQTT communication library. The application takes advantage of 3D transformations for video overlay functionality, and handles scheduling and execution of digital microfluidic protocols. Furthermore, the application includes both a plugin and process manager for handling Python and Node JS child processes. In addition, I worked on a companion library for enabling programmable control of the DropBot in both Python and JS.

NVIDIA DEEP LEARNING
DIGITS
Coop (May 2016 - September 2016)

DIGITS is an open source machine learning server based platform for training neural networks in Python and Lua. I developed machine learning algorithms for feature extraction (in Caffe and Torch), extended the web based UI for neuron and network visualizations (using Flask and Angular JS), and enhancing the job scheduler and REST API. I also continually performed code reviews, developed tests, and followed Kanban and Agile development procedures.

LANI INC
Entrepreneurial COOP (CTO) January 2015

I was the technical cofounder of a software startup involving 3D printing. Lani was a web service for scheduling, pricing, and visualizing 3D Prints. Lani was deployed on an AWS EC2 instance with a Ruby on Rails backend. Furthermore, I developed a 3D Model renderer using Three JS and WebGL as well as many backend Mesh libraries for mesh repair, model stitching, and other pre and post processing procedures.

NVIDIA
Internal Software Developer
Coop (January 2016 - April 2016)

Developed a PCIe and NVLink topology Linux visualization tool in Python, WebGL, and D3.js. This project involved various tree traversing and graphing algorithms such as the Reingold-Tildford Algorithm, and Forced Layouts. Furthermore I worked on a WebGL and ReactJS based internal spec designer tool. This project involved such processes as UV Mapping, Active Grid Textures, and Voxel Painting.

NATIONAL INSTITUTE FOR NANOTECHNOLOGY
Two Coop terms
Coop (January 2014 to April 2014)
Coop (September 2014 to December 2014)

Designed various audio distortion and amplifier circuits, as well as signal processing software in Matlab, Python, and C++. Developed the initial prototype for the Molecular Overdrive Guitar Pedal and created circuits to automate some of the groups device testing procedures. Furthermore, I fabricated thin film devices in a cleanroom setting. I also received second authorship of the paper: "Musical molecules: the molecular junction as an active component in audio distortion circuits."

MENLO SYSTEMS GMBH
Software & Hardware Engineering Coop
(May 2013 to August 2013)

Menlo Systems is an innovative laser company operating in Martinsried, Munich Germany. I worked on two main projects: First I worked on a ray tracing simulation that accounted for gaussian optics (such that rays could be bent by movable lenses). The rays updated in real time, and could be optimized to match certain characteristics. I also worked on an embedded optical mechanical system in C++ for Astro Combs to account for the redshift of interstellar light. One application of these devices was to help astronomers find smaller more earth-like exoplanets then the current limits of our technology. I also was responsible for the setup of the optical-mechanical systems.

SKILLS

MACHINE LEARNING:

Experience with PyCaffe, Torch, and Tensorflow.js deep learning frameworks. Developed for the open source DIGITS (Deep Learning GPU Training System) project at Nvidia. Worked on feature extraction techniques for Convolutional Neural Nets for Caffe and Torch, and built a Network Visualization tool for Caffe and Torch.

LANGUAGES OF CHOICE:

JavaScript, C++, Python, C# (Unity Game Engine), Ruby, and Matlab/Octave (Signal Processing Toolbox).

PROGRAMMING MODELS / DESIGN PATTERNS:

Extensive knowledge of object oriented programming, MVC architectures, reactive programming patterns, and functional programming paradigms.

ELECTRONICS :

RC Filters, Amplifiers, Oscillators, Differentiators, Transformers, etc. Worked with complex systems for audio related circuits, optical systems, bioinformatics, and microfluidics. In depth experience in circuit design tools such as EagleCAD and KiCAD.

CLOUD PLATFORM AND WEB DEVELOPMENT:

Full stack web developer with a high level of experience in: NodeJS, HTML5/ CSS3, MVC & Server Frameworks (Flask, Express, ReactJS, Rails, Angular), and databases like Redis, Mongo, Postgres, MySQL, and beyond. Extensive experience with: Electron, Bootstrap, Nginx, and Linux/Bash. Deployed many applications on various cloud platforms such as AWS (EC2), and Heroku.

3D GRAPHICS:

Strong knowledge of 3D Meshes, 3D Rendering / Graphics Algorithms, and Game Development. Used WebGL and ThreeJS for many personal and corporate related projects.

SIGNAL PROCESSING:

Audio Distortion Software, Spectral Analysis of Audio Waveforms, Electrical-Mechanical, and Optical-Mechanical systems.

DIGITAL CONTROL SYSTEMS:

Multi-threading, drawing, and control of optical sensors. Worked on control systems for both Microfluidic devices, and fuzzy logic systems. Wide range of experience with many IC electronics, and low level communication protocols.

MAIN PROJECTS

DropLab DMF Device (Capstone Project):

A breadboard for moving fluids using a grid of electrodes. This project involved developing a transformer based amplifier circuit, implementation of a new materials, and software for improving DMF device automation. I focused on building a local flask based web server to control the and monitor the board using a REST API. I also developed a React JS front end to display the current board state and running recipes. I was later contracted to extend the software for Sc-Bots' open hardware platform: the DropBot.

Biofeedback Reader:

Developed an analogue device to capture and record galvanic skin response, as well as a multi-threaded java application for real-time monitoring. The purpose of the project was to create a fun game for family and friends using GSR as a form of lie detector.

Real-time Unity Mesh Importer:

Worked on a plugin to import/export STL files via HTTP requests in the Unity Game Engine. Applications include allowing developers to add 3D Printing design tools to their games, as well as potentially allowing developers to export assets to sites such as Thingyverse.

Autonomous Driving Dashboard System:
Fuzzy Logic and Neural Networks

Developed a car dashboard system to identify the various traffic symbols in front of a driver. The system was built using the Torch framework and an AlexNet neural network architecture. The application ran as a local web server with a React based front-end.

Multi-Agent Path Finding for Dense Systems:
Undergraduate Research Project (NE 459) with Prof. William Cowan

Javascript based path finding systems for multi-agents in a dense setting. Approached via similar paradigms as those used in train, and traffic based systems. This was incorporated into a digital micro-fluidic system to handle multiple moving drop units simultaneously.

MolCToy Contribution Project:
Nano-Electronics

A four person project in which we proposed contributions to the Open Source Tool MolCToy (A simulation tool for investigation of hopping transport mechanisms). Our contributions included adding support for modeling of photo-active hopping.

And more…

These are just a few things I've worked on that I'm especially proud of. To see more of my projects checkout my github: https://github.com/lucaszw

MY FAVORITE COURSES

Object Oriented Programming for Nano-Simulations:
Fundamental of Object Orientation, C++ Object Oriented Syntax, Pointers & Dynamic Memory Allocation, Memory Management, Inheritance, Templates, and the STL, Numerical Analysis, Linear Algebra in C++, Fourier Transforms in C++, and Monte Carlo Methods.

Micro and Nano Scale Computer-aided Design (CAD):
Modeling and simulation of micro, nano, and fluidic systems. Learned how to use Finite Element Analysis to simulate how a design would act under real world forces. In addition this course gave a review of differential-equation systems, boundary conditions, and solvers for complex, coupled transport problems.

Nano-Electronics (Applied Quantum Mechanics):
Continuation of Quantum Mechanics with a focus on applications in next generation electronic devices. Exploration of simulation techniques used across Open Source projects on Nanohub, accompanied by a project to introduce students to open research, and contribution.

Computational Intelligence: Fuzzy Logic and Neural Networks:
The course introduces novel concepts for computational intelligence based on soft computing techniques. It includes concepts on knowledge based reasoning, fuzzy inferencing systems and connectionist modeling based on artificial neural networks.

Continuum Mechanics:
Analysis of differential equations to model fluidic systems using tensor operations and tensor calculus. Applications for this course include modelling of fluids using the Navier-Stokes equations.

Algorithms and Data Structures:
Course covered asymptotic and algorithm analysis, relationships and data structures, Sequential storage: Lists, queues, stacks, deques , Hash tables , Trees , Priority queues and heaps, Sort algorithms, Graphs and graph algorithms, Algorithm design techniques, Complexity classes and NP completeness.

AWARDS

Autodesk Capstone Software Design Award
University of Waterloo (Winter 2017)

NormEsch Entrepreneurial Capstone Award
University of Waterloo (Winter 2017)

Engineers of the Future Trust
University of Waterloo (Fall 2016)

Baylis Medical Capstone Design Award
University of Waterloo (Fall 2016)

Velocity Fund 25K
University of Waterloo (Summer 2015)

Norman Esch ECOOP Award
University of Waterloo (Spring 2015)

Excellence in the Sciences
BC Science Association and BCIC (2012)

Presidents Scholarship
University of Waterloo (2012)

Best in Fair
District Science Fair (2012)

HKVCA Cross-Canada Wide Writing Contest
Second Place (2011)

Bronze Award in the National Science Fair
Charlottetown (2012) and Toronto (2011)

Best Rhythm Section Player
BC Interior Jazz Festival (2011)

Adam Johan Bergren
Research Officer
Program Coordinator, Hybrid Nanoscale Electronics
National Institute for Nanotechnology
National Research Council Canada
Edmonton, AB T6G 2M9

To Whom It May Concern:

This letter is to recommend Lucas Zeer-Wanklyn. I hired Lucas for a 12 week co-operative work term at the National Institute for Nanotechnology for a term from January to April of 2014. During this term, Lucas was tasked with developing and refining a new circuit component based on a molecular tunnel junction for use in operational amplifier circuits with applications in the audio industry (guitar distortion devices).

The project Lucas worked on included multiple complex topics and tasks, including software programming, data acquisition and analysis, nanofabrication, circuit design and integration (including a fully functional full prototype), electrochemistry, nanoscale surface modification, the design of complex scientific experiments, and the clear documentation of experimental results. During the work term, Lucas displayed and developed competencies in all of these areas. He displayed highly creative and critical thinking and moved the project forward much more rapidly than was planned. In addition, he works very well with others: he is always willing to help out and move others forward when possible.

Lucas is able to understand and communicate clearly about multiple complex topics, which contributes greatly to the development of understanding at the cutting edge of research in nanotechnology. Due to Lucas's outstanding efforts, we were able to thoroughly investigate issues that we did not anticipate being able to understand in the limited time available. Lucas's ability to approach a project with high levels of competency, enthusiasm, and dedication enabled the schedule to move ahead and produced results that accelerated the project.

The outcomes associated with his efforts will likely result in a successful commercial prototype (the first-ever commercial device that utilizes molecular electronics technology) and a scientific manuscript. The abilities demonstrated by Lucas approaches the highest levels of achievement. For all of these reasons, Lucas has earned my highest recommendation!

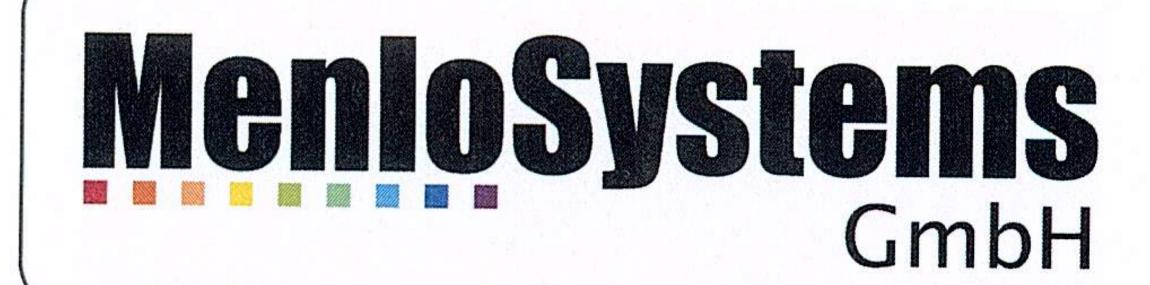If any additional information is required, don't hesitate to contact me.

Adam Johan Bergren, Ph.D.
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Letter of Reference	Martinsried, August 05, 2013

TO WHOM IT CONCERNS

It is my great pleasure to recommend Lucas Zeer-Wanklyn for any position he wishes to apply for. Lucas was a valuable addition to Menlo Systems during his internship here in Germany from May 6th to August 16th 2013. He showed a high degree of dedication to the projects he was assigned, and was always enthusiastic to learn more. During his short time here, Lucas managed to develop software programs for our Astro Comb product, thoroughly characterized Hollow Core Fibers (HC-PCF), and put together optical setups for HC-PCF pulse delivery. He is a very fast learner, and was able to operate different kinds of lab equipment without requiring assistance. With his knowledge in such areas as Fabry-Pérot Cavities, Gaussian Beams, and Ray Optics, Lucas managed to resolve difficult physics and programming related problems.

Lucas displayed a great deal of leadership skills, and independently discovered creative ways to push his projects forward through designing advanced simulations, complex user interfaces, and assembling mechanical devices for fiber coupling. Lucas consistently submitted well-researched and detailed reports about his projects allowing us to move forward with the knowledge he provided. Lucas is very bright and has exceptional problem solving and communication skills.

I am certain that Lucas will exceed your expectations if you decide to hire him as he did for us here at Menlo Systems. Do not hesitate to contact me if you have any further questions.

Yours Sincerely,

Dr. Michael Mei
Menlo Systems GmbH

To whom it may concern,

I had the great pleasure of working with Lucas in association with TEDxUW's 2012 conference, where he played a pivotal role in helping develop an interactive web app as part of the attendee experience design. He committed a significant amount of time to the project despite also having a full course-load as a first-year engineering student, and even helped out further on the day of the event. Lucas demonstrated excellent technical skills, as well as a passion and insight for user experience design that truly made the project a success. Working with an ever-shifting design brief and dwindling resources, Lucas always managed to find the pathway to move the project forward, and clearly thrived in the face of that challenge. Beyond his technical prowess, Lucas is also extremely personable, and worked well with all the other development team members, often stepping into leadership roles when the project hit dead ends.

I would gladly endorse Lucas for any position he should choose to apply for, as it is clear his interpersonal skills, problem-solving capacity, and work ethic will enable him to succeed in whatever he sets his mind to.

Sincerely,

Peter Last
LiveStream Event Coordinator
TEDxUW 2012
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