Erik C. M. Johnson

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Education

M.Sc. in Visual Computing

Oct. 2019 - May 2022

Universität des Saarlandes & Max-Planck-Institut für Informatik (MPI-INF) *Saarbrücken, Saarland, Germany*

- Computer science degree specializing in image processing, computer vision, and image synthesis (rendering)
- Graduation German grade of 1.1 (sehr gut) or GPA of 3.93 / 4
- Thesis done at MPI-INF D6 under Prof. Dr. Christian Theobalt: Monocular Non-Rigid 4D Reconstruction using a Deformable Implicit Scene Model
- Presented thesis work as part of the 4th International Workshop on Dynamic Scene Reconstruction (DynaVis) at CVPR 2023

B.Eng. in Electrical Engineering (Minor in Mathematics)

Sept. 2012 - April 2017

Carleton University *Ottawa, Ontario, Canada*

- Graduation CGPA of 11.83 / 12 (A+) or GPA of 3.98 / 4
- Five co-op work terms completed (total of 20 months)

Publications

E.C.M. Johnson, M. Habermann, S. Shimada, V. Golyanik, and C. Theobalt. June 2023. *Unbiased 4D: Monocular 4D Reconstruction with a Neural Deformation Model*. CVPR 2023 (Workshop)

D. Penley, S. Shafi, **E. Johnson**, N. McCallum, E. Molavitabrizi and J. Laliberté. March 2017. *Enabling Low Altitude Small Uninhabited Aerial Vehicle Operations to Protect Canada's Critical Infrastructure*. Natural Resources Canada

Selected Courses

Summer 2021 **Connections of Deep Learning and PDEs for Visual Computing (Seminar)**, Prof. Dr. Joachim Weickert
Winter 2020/21 **GPU Programming**, Prof. Dr.-Ing. Philipp Slusallek
Winter 2020/21 **Deep Learning and Optimisation for Visual Computing (Seminar)**, Prof. Dr. Joachim Weickert
Summer 2020 **Computer Vision and Machine Learning for Computer Graphics (Seminar)**, Prof. Dr. Christian Theobalt
Summer 2020 **Realistic Image Synthesis**, Prof. Dr.-Ing. Philipp Slusallek
Summer 2020 **Image Compression**, Dr. Pascal Peter
Winter 2019/20 **Differential Equations in Image Processing and Computer Vision**, Prof. Dr. Joachim Weickert

Research Experience

Deformable Neural Implicit Scene Model Research Assistant

Oct. 2020 – Dec. 2021

Max-Planck-Institut für Informatik (MPI-INF) *Saarbrücken, Saarland, Germany*

- Experimented with state-of-the-art deformable neural implicit scene models, including approaches leveraging an articulated skeleton prior
- Developed a novel approach using a scene flow prior for general object reconstruction resulting in a conference submission
- Implemented GPU-accelerated research code in PyTorch (Python) & CUDA (C++), and ran experiments on Slurm-managed GPU servers

Ray-Tracing Radar Simulation Research Assistant

Jan. 2020 – May 2020

German Research Center for Artificial Intelligence (DFKI) *Saarbrücken, Saarland, Germany*

- Extended simulated antenna model to allow for user-specified antenna patterns requiring addition of .exr image format support
- Utilized electromagnetic simulation software to compute antenna patterns from antenna geometry

Music/Audio Processing Research Assistant

May 2016 – Aug. 2016

Fraunhofer Institute for Integrated Circuits (IIS) *Erlangen, Bavaria, Germany*

- Contributed to open source library mir_eval used by audio/music researchers through addition of state-of-the-art metrics and improving performance resulting in greater accessibility to high quality audio separation evaluation

Electronics Research Assistant

May 2013 – Aug. 2013

Department of Electronics - Carleton University *Ottawa, Ontario, Canada*

- Assisted in the ongoing design, assembly, and testing of an Atmel microcontroller (ATmega1284p) system resulting in a new revision of the PCBs
- Modified PCB designs in gEDA to add new component sensors (e.g. BMP180, MPU6050) allowing for the device to be used in a wider range of applications including by other students in their capstone project
- Developed post-processing software using Python to provide meaningful data visualizations

Teaching Experience

Teaching Assistant

Universität des Saarlandes & Carleton University

- Led tutorials, offered individual assistance, corrected assignments, and administered exams for the following courses:
  - IPCV · Image Processing and Computer Vision — *Summer 2021*; Saarland
  - CG1 · Computer Graphics 1 — *Winter 2020/2021*; Saarland
  - MATH 2107 · Linear Algebra II — *Winter 2016*; Carleton
  - MATH 2004 · Multivariable Calculus for Engineering or Physics — *Fall 2016, Fall 2015, Winter 2014*; Carleton
  - MATH 1104 · Linear Algebra for Engineers and Scientists — *Fall 2013*; Carleton

Weekend Camp Instructor — *Jan. 2014 – Feb. 2014*

Virtual Ventures — *Ottawa, Ontario, Canada*

- Educated future scientists and engineers in grades 7-10 on the topic of electronics and programming using the Arduino open source microcontroller system resulting in increased excitement to pursue studies in STEM fields

Work Experience

Senior Systems Software Developer — *May 2017 - July 2019, May 2022 - present*

QNX Software Systems (BlackBerry) — *Ottawa, Ontario, Canada*

- Developed camera and sensor middleware in C++ for QNX's microkernel RTOS targeting the automotive market
- Demonstrated a mobile robotics platform with ROS2 using hardware accelerated CNN inference and stereo disparity for CES 2023
- Modified Linux kernel modules in Android and Yocto for hypervisor paravirtualization using VirtIO
- Collaborated with customers on the delivery of new features and resolution of issues
- Created a rear-view screen concept for CES 2019 demonstrating surround view and visualizing lidar sensor fusion

Electronics Product Design Intern — *May 2014 – Aug. 2015*

GasTOPS, Ltd. — *Ottawa, Ontario, Canada*

- Developed Windows applications in C# for interfacing with ODM (Oil Debris Monitoring) devices
- Utilized Monte Carlo simulation for design optimization resulting in a streamlined manufacturing process
- Tested Modbus RTU and CAN bus 2.0B communication protocols using Python scripts

Applied Projects

Zebra Dodge — *Aug. 2017 - Sept. 2019*

CloseCall Studios — *Ottawa, Ontario, Canada*

- Utilized the Unity game engine to develop a mobile game in partnership with an artistic director
- Developed software in C# for all non-engine game systems, including input handling; object generation and pooling; and game state management
- Designed an encrypted save file system using asynchronous programming in C# that allowed for persistent and secure progression
- Implemented GLSL shader post-processing effects to provide player feedback on game events

Capstone Engineering Project - First-In Risk Evaluation (F.I.R.E.) System — *Sept. 2016 - April 2017*

Carleton University — *Ottawa, Ontario, Canada*

- Designed UAV (quadcopter) system for data collection targeting fire response application
- Developed ROS software on an embedded Linux platform (Raspberry Pi)
- Interfaced with open source UAV control software (Arducopter) and sensors (e.g. camera, thermal imaging)

Carleton CanSat Team (Raven Knights) — *Jan. 2015 - June 2016*

Carleton University — *Ottawa, Ontario, Canada*

- Led software development team in 2015 and electrical team in 2016 for mock satellite competition
- Developed real-time embedded software in C for an NXP Kinetis (KL16Z; ARM Cortex-M0+ core) device
- Secured 2nd place out of 70 international teams in 2016 and 3rd place out of 60 teams in 2015
- Used Git version control system to maintain team coherence
- Implemented software performing the following functions:
  - Gathered and transmitted sensor data to a remote ground station
  - Tracked flight state and modified mode of descent based on state
  - Recovered state and calibration from momentary power loss
  - Used PID feedback control to maintain constant orientation during descent

Volunteering

IEEE - Carleton Student Branch *Sept. 2012 - April 2017*

Carleton University *Ottawa, Ontario, Canada*

- Held the positions of Secretary, Office Director, and Workshop Director for the Carleton chapter of IEEE
- Increased visibility of IEEE in the Ottawa engineering community through outreach events and regular workshops
- Led and took minutes for IEEE Carleton executive meetings leading to increased meeting efficiency
- Provided academic support services to students in electronics, systems and software courses

Awards

Nov. 2018 **Second Place**, Ottawa Game Jam 2018

July 2017 **First Prize in the Student Design Competition**, International Humanitarian Technology Conference 2017

May 2017 **Senate Medal for Outstanding Academic Achievement - Undergraduate**, Carleton University

May 2017 **Deans' Honour List**, Carleton University

Jan. 2017 **First Place**, CUHacking 2017

Dec. 2016 **Carleton Academic Scholarship**, Carleton University

Sept. 2016 **Chipworks/Rebekah Proud Memorial Award**, Carleton University

Sept. 2016 **W. R. Davis Engineering Scholarship**, Carleton University

Dec. 2014 **Carleton Academic Scholarship**, Carleton University

Dec. 2013 **Carleton Academic Scholarship**, Carleton University

Dec. 2012 **Carleton Academic Scholarship**, Carleton University

Sept. 2012 **Faculty of Engineering and Design Scholarship**, Carleton University

Skills

Programming Languages & Tools C/C++, Python, C#, Subversion, PyTorch, git, LaTeX, Docker, CUDA, OpenGL, GLSL/HLSL/Cg, Slurm

Design & Simulation Software Godot, Unity (Game Engine), Blender, Eclipse-based IDEs, Visual Studio, MATLAB/Simulink, Eagle (EDA)

Mathematical Concepts Multivariable Calculus, Linear Algebra, Optimization, Neural Networks, Geometric Reasoning

General Computers Linux, Windows, QNX Neutrino, Embedded Linux, Microcontrollers, Microsoft Office Suite