Charlie Angela Mehlenbeck

10 years professional Software Development experience

Would like to work on intellectually challenging computer vision, machine learning, or other advanced software driven products: in wholistic more than software systems, a stimulating team environment, and in direct response to customer needs. – Especially robotics, but always things with lots of growth potential through abstraction.

Conact me on my website for other contact details

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EXPERIENCE

Other, Home — *Professional Development*
June 2022 - Ongoing

- Continued development of core product as founder and lead developer at Horse Robotics.
- Began creating personal social media presence & website
- Began dev of "Model Programmer" (see Projects, pg 2)
- Studied large language models, open source equivalents, and experimented with some open weight models on Lambda A100 cloud and Vast.ai instances after researching cloud providers.
- Experimented & extensively tested ChatGPT & competitors, it's programming capabilities across all languages I've used, and practiced working with it on several smaller projects, including UnitAlg (a Linear Algebra framework for C and Python inspired by Unity's math libraries), a python video player application, a custom robot path following algo based on Pure Pursuit, part of a Unity3D game, and more.
- Helped a friend together with my co-founder who was in dire need to find housing and work on mental health while each learning a lot about humanity ourselves

Horse Robotics, Plainwell Mi — *Founder*
Feb 2019 - Ongoing

- Wrote highly extensible from scratch embedded software for platform-agnostic bare metal control of a small robotics platform, including: Kalman localization using internal and remote sensors, communication, manual control, memory management, sensing and motion control, path following, monitoring, and supervised the implementation & testing of precision network time keeping
- Designed and supervised the implementation of path planner and high speed tag tracking algo similar to ArucoDCF using UoM's AprilTags, Kalman filter, & secondary markers
- Designed & built custom rev 1 PCB and housing for smaller agricultural 'microbots'
- Deployed managed and pair built/programmed company website.
- Supervised and aided in the creation of a 3D simulation for microbot control development and testing in Unity3D with full ROS integration and made sure all firmware would compile to both ROS based simulated control and to bare metal hardware
- Supervised the development of a machine learning pipeline for AI image segmentation, some initial training, and data labeling software improvements
- Built indoor localization test environment and began work on automatic sensor rig calibration & verification software.
- Implemented and tested larger robot localization using tags, GPS, IMU, & Odom using ROS's localization package

STRENGTHS

Whole System Design Mindset, Research, High Performance implementations, Reusability Focused, Documentation & Diagramming, Fast Learning, Quality Custom Visualizations

SKILLS

Robotics, Simulation, Custom Algorithms, Computer Vision, Software Design, Rendering Technologies, Machine Learning (modern+classical including LLMs), Docker Compose, Stats & Data Analysis, Digital circuit design, CAD & CNC, WordPress, Platform agnostic

PROGRAMMING LANGUAGES

Python, C, C#, C++, MySQL, Objective-C, VHDL, Verilog, fragment & vertex shaders, HTML, CSS, LaTeX, JavaScript, PHP, XAML, JAVA, various "Basic" languages

FRAMEWORKS

ROS, .Net, UnityEditor, numpy, OpenCV, OpenCASCade, Keras, Tensorflow, OpenGL, Cocoa, PCL

SOFTWARE
(NOTEWORTHY)

Unity3D, VS (code), Fusion 360, FreeCAD, Eagle, KiCAD, Jupyter & Anaconda, Xilinx Vivado, Microsoft suite & open alternatives, XCode, PS or Gimp, Blender

HOBBIES

Research, Inventing, Planning Exponential Projects, Pacing & Thinking, Game Design, Singing, Dog training, Woodworking, Rat Petting, Welding, Gardening

- Designed and built 2 larger test robots for automatic seeding and weeding development and supervised their ROS configuration

Horse Robotics, Plainwell Mi — *Founder*
Feb 2019 - June 2020???

- Created custom parametric software model of a novel thin soft robotic actuator capable of XY motion across a surface
- Planned actuator's in-house small production runs, molding, and testing.
- Helped design and supervised the creation of various supporting projects including: wax injection molding chamber, heater controller, PCB milling software improvements, soft robotic actuator test controller, and wax blowout machine
- Built, managed, and later upgraded in-house server infrastructure and intranet using Dell r720s running Proxmox and several VMs and containers for Confluence, Jira, GitLab, open alternatives, stock data collection, DNS, Kubernetes, and more
- Incorporated and latter oversaw Horse Robotics's Accounting
- Trained & mentored co-founder in advanced engineering spanning many technologies, tinkerings, and manufacturing techniques

Sabbatical, Home — *Professional Development*
Feb 2019 - June 2020???

- Made money to start company using stock market crash, and began work on "ROStocks" (A ROS package to collect stock data and latter facilitate AI trading with safety in mind)
- Designed and built a completely custom robotics platform (see Mecanum Bot under Projects)
- Learned ROS and FPGA programming using Xilinx Zynq 7000 SOC, petalinux based custom rootfs compilation, and custom soft hardware driver creation

Dematic, GR Mi — *Software Systems Engineer*
Jan 2018 - Feb 2019

- Initial R&D on embedded BLC motor controller fault prediction using deep learning on an ST ARM Cortex M processor given very tight CAN bus network constraints for randomized partial data collection
- Built from scratch C network adapter for Yaskawa 6axis robotic arm for integration with a third party.
- Walk through configuration screen improvements for conveyance system controllers using XAML and C#
- Advised upper management in the partnering with 3rd party CV+ML robot picking solutions, traveled to, designed & executed a capabilities test plan with those third parties
- Marketed a grassroots custom DSL (Domain Specific Language) to upper & product management, with praise from scrum leader, manager, VPs, and other development teams
- Created a sudo 'dataflow style' high level DSL abstraction on multiple industrial and non-industrial Computer Vision & Machine Learning frameworks for general use, with a visual layout GUI, capable of highly configurable auto multi threading similar to Apple's GCD, and a single & multiprocess structure similar to ROS.

AWARDS
Phi Theta Kappa (KVCC)

PROJECTS (excerpt)
Model Programmer A GUI tool to integrate LLMs with the Linux terminal to complete large projects with user assistance and aid in the development of competing open weights or paid models.

Mecanum Bot A fully custom Intel powered mobile robotics platform with FPGA control and data logging, custom PCB, 3d printed wheels, and CNC chassis, ROS integration, 3D SLAM, thermal imaging, custom soft hardware with AXI interface on a Zynq 7000 SOC, custom Linux drivers, and wireless control. – Was going to do predictive AI traction control using camera data and high speed motor current measurements in soft hardware, with 3D thermal imaging for indoor insulation and moisture analysis

CNC Room Construction + new workspace furniture design

Quadcopter DIY Body+firmware + board – Board built using custom CNC software – Goal: autonomous building 3D thermal mapping and heat propagation

- Managed the software side of a small R&D team through the creation of an internal robot picking and package measurement platform.
- Learned from a senior controls engineer as implementing PLC control of various sensors and actuators for said platform

Dematic, GR Mi — *Software Engineer*
Sep 2015 – Jan 2018
- Developed high throughput logistics simulation in Unity3D with senior team members, focusing mainly on the rendering, layout, editor extensions, and physics technologies
- Built a DSL in Unity3D for the import of logical and CAD warehouse data to aid in the populating of said simulation with existing warehouse sites in need of improvement
- Helped new product development team win internal competition to use Unity for Dematic as it's eventual sole simulation environment.
- Devised a custom Oct-tree mediated control of when object positions would update based on camera location and view direction to maximize simulation scale to many thousand of moving virtual product and faster than real time performance
- Modeled various automatic storage and retrieval systems with custom CAD like realism at close range, Level of Detailed down to orthographically imaged multi plane sprites with custom shaders at far range
- 3D modeled visually accurate peace picking user interface devices and implemented high performance 3D button interaction for many thousand device simulations
- Designed, built, iterated, and extensively performance tested a custom conveyance simulation capable of handling package collision at junctions and speed changes while facilitating photo eye and speed control in a completely custom, reasonably accurate, but highly performant way.
- Created Unity Editor extensions for easy conveyor and linear motion system layout and configuration, used by many development team members with usability complement.

Magna Mirrors, Holland Mi — *Computer Vision Programmer*
Jan 2012 - Aug 2015
- R&D in optical deflectometry (3D reconstruction of mirroring surfaces) Implemented published works, and tested theoretical functionality with custom ray tracer, 3D results rendered in OpenGL
- Built custom ray tracer in OpenGL to regression test optical deflectometry math, calibration of optical deflectometer test rigs, and demonstrate various theoretical concepts about defects in production parts
- Software development for computer vision systems, used primarily for on-line quality control test equipment. — Systems uniquely capable of providing custom statistical renderings of digitally aligned parts for engineering team analysis, as well as live detailed scrap data using a MySQL DB and custom front end, utilized for continuous process improvement by production teams
- Various production process improvement, testing, and statistical analysis — Primarily using the custom-built vision

systems & statistical renderings of many overlaid production parts
- Main algorithms in final design: Levenberg Marquardt, ICP initialized with major axis normal vector and rasterized part surface measurements, custom correspondence algorithm, weighted thresholding & custom connected component analysis based key point recognition, custom histogram based classifier training tool, motion detection and part presence detection using background subtraction and morphology techniques, regression based localization, Dijkstras alg, and more

EDUCATION

Self Teachings, On-line — *Everything*

Ongoing

- This is not an exhaustive list. I never stop learning about literally all fields of study. It is my single greatest hobby and time consumer and always has been.
- LOTS of electronics, software, ML, machining, printing, wood working, welding, molding & casting, manufacturing, mechanisms and process videos and on-line training content
- Many numerous scientific papers at the top of their fields
- On-line courses on FPGAs, Self driving cars, ML, Robotics, and more

Kettering University, Flint Mi — *Engineering Physics*

2011-2012

- Left for medical reasons, and then saw little benefit to return given how low, for what I am interested in, the cost is to do your own R&D that can often move faster and with more useful purpose than at university. Also, the work I was already then doing, with complement from multiple professors we contracted in from several universities or whose PhD work I then referenced, was more stimulating and fun. Finally, the availability of free educational content (available in quieter more personal living conditions than I was in at school) then frequently surpassed that of university quality and can now I believe be made up-to-date more quickly than a curriculum and testing standards can feasibly be made to keep up with.

KVCC, Kalamazoo Mi — *Transferable course work*

2009-2011

- Received Phi Theta Kapa having completed nearly half my degree while still in high school