Matthew Harper

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EXECUTIVE SUMMARY

Innovative engineering and automation expert experienced in leading cross-functional teams delivering scalable software, technical, and autonomous solutions. Proven track record in leading teams, implementing transformative solutions, while applying novel practices to improve reliability, scalability, and feature delivery. Strong background in AI/ML, data analytics, and large-scale emerging technology system integration with expertise in end-to-end project execution, operations, maintenance, and mentoring future engineering leaders. Experienced in exploration, research, and development of new emerging technology, artificial intelligence techniques, and applications which bridge the gap between theoretical concepts into practical, real-world solutions.

INNOVATION LEADERSHIP & STRATEGIC COMPETENCIES

- **Developed Autonomous Production & Smart Field Systems** delivering 5% production improvement, 7% availability gains, and $10MM cost savings across multi-site operations.
- **AI-Driven Reliability & Predictive Maintenance** increasing asset MTTF greater than 40–50-year horizons and reducing failure rates enterprise-wide.
- **Mission-Critical Systems Innovation** improving network reliability from 70 year to 858-year MTTF for aerospace launch reliability, safety, and operations.
- **Enterprise Analytics & Decision Platforms** enabling real-time situational awareness and decision-making featuring production and operations dashboards for real-time situational awareness.
- **Novel AI-based artificial lift gas injection** system utilizing gradient descent for injection and production optimization.

FEATURED AI/ML & COMPUTER VISION PROJECTS

Integrated AI & RCM-Based Operations & Maintenance Practices (GitHub) LINK
Computer Vision Based Pipeline Monitoring with HSV Induced Segmentation (GitHub) LINK
Industrial AI Asset Monitoring with HSV Induced Segmentation (GitHub) LINK
Multimodal AI - Vision Language Models Using CLIP for linking Text and Images (GitHub) LINK

PROFESSIONAL EXPERIENCE

AI Research | University of Houston | 2024–2025

- **Research, development, and exploration** of new and existing artificial intelligence techniques.
- Developed machine learning applications with the objective to bridge the gap between theoretical AI concepts and practical, real-world solutions.
- **Model development and training** accomplished by selecting appropriate machine learning and deep neural network models.
- **Hyperparameter tuning and feature engineering** performed to select relevant features that enhance model performance.
- **Deployed data visualizations for model transparency** to explore data patterns and trends through visualizations gaining insights and to identify potential improvement.
- **Advanced practical AI, computer vision, and analytics adoption** by contributing to curriculum-aligned research.

Automation Leader - Engineering | Facility & Production | Surge Energy (2021–2024)

- **Managed MM projects developing scalable autonomous production systems** using integrated monitoring platforms and schemas aligning corporate and IT governance and strategies.
- **Led the development and implementation of emerging technologies** with data driven insights to optimize production and reduce process alarms, improve facility performance, and enhance operational decision-making.
- **Conducted comprehensive risk assessments** and implemented safety measures to minimize operational risks and decrease probability of failure on demand of process shutdown systems and unplanned shutdown events and maintenance. This increased MTBF and optimized facility and unit production and safety.

- **Provided technical leadership for electrical engineering and instrumentation projects**, including design, implementation, and maintenance of electrical infrastructure. Developed instrument and electrical design basis for use in new and existing projects and facilities. This provided engineering and project teams with documented specifications for design, construction, installation, and operation which led to increased efficiency and reduced alarm and shutdowns during unit operation.
- **Developed and implemented condition-based maintenance strategies** to improve equipment reliability and reduce maintenance costs. This included the increased real-time monitoring of process conditions and instrument devices with machine learning algorithms and models to detect trends and anomalies leading to advanced detection techniques and operational alerts.
- **Managed projects, vendors, and contractor teams** for control and electrical system deployment.
- **Led design, construction, commissioning, and startup** of production facilities and well pads.
- **Deployed transformative AI/ML-Driven initiatives** including novel reliability, predictive maintenance, and autonomous operations methodologies increasing asset MTTF and reducing failure rates globally.
- **Engineered Remaining Useful Life (RUL) prediction models**, enabling predictive maintenance strategies and reducing unplanned downtime across critical systems.
- **Team lead in implementing ML-based optimization projects for real-time dashboards**, predictive analytics, and alarm reduction, improving decision-making and efficiency.
- **Directed CI/CD PLC/DCS/HMI software projects for autonomous instrument-based control systems** (Smart Lift, Smart Tank, Smart Level) increasing production efficiency while reducing downtime.
- **Provided hands-on operational leadership** supporting training, commissioning, troubleshooting, and sustainment of mission-critical facilities, leading process safety and optimization initiatives including risk assessments, PHAs, mechanical completion, and implementation of mitigations to improve operability and reliability.
- **Led development and deployment of edge-based autonomous PLC/SCADA systems** (Smart Lift, Smart Tank, Smart Level, Tankless Battery), applying analytics and automation to reduce manual intervention, enhance safety, and optimize field operations.
- **Managed end-to-end project management and engineering execution**, producing complete electrical, instrumentation, and control system documentation and governing full project lifecycles from design basis and specification through software development, hardware installation, commissioning, testing, and final activation.
- **Governance and knowledge management provided for teams** in the transfer of tacit and explicit knowledge. Developed basis for instrument and electrical facilities operation and design.
- **Automated measurement and material balancing** at production and custody transfer points, documentation of meter factors, and compliance with API MPMS and TRRC Title 16.
- **Mentored engineers and analysts through structured knowledge transfer**, design reviews, and technical leadership.
- **Successful scaled pilots of emerging technologies** such as field based edge computing, embedded AI/ML system integration, production platforms supporting operations, reliability, and optimization.

I&C Engineering Lead (Consultant) | Vandenberg, CA AFB/SFB | Firefly Aerospace (2021-2021)

- **Led design and commissioning of mission-critical automation**, instrumentation, and control systems for launch operations.
- **Designed active Area Warning System (AWS)** which served as the sites safety alert notification system providing Space Launch Complex 2 (SLC-2) at Vandenberg AFB, CA with a site wide hazardous communication alert system complete with robust audible and visual signals.
- **Lead network architect for high-availability networking and timing systems** with triple redundant precision time protocol (PTP) satellite timing network utilizing GPNS/GPS pulse per second (PPS) Master Clock Time Synchronization System (MCTSS) for all timing operations and interface with range operations at Vandenberg Air Force Base which met or exceeded the general design policy 3.2.1 of AFSPCMAN91-710 for system failure with catastrophic hazards.
- **Developed Analytics & Decision Platforms** enabling real-time situational awareness and faster executive decision-making featuring production and operations dashboards for real-time situational awareness.
- **Provided technical guidance for launch complex projects** ensuring compliance and alignment of Space Force range safety standards, launch requirements, and mission objectives.
- **Managed strategic alignment of resources with cross-functional teams** ensuring designs met project scheduling, costs, safety, reliability, maintenance, and operational requirements.

Sr. Automation Engineer | Automation & Electrical | Oxy (2018–2020)

- **Developed predictive analytics and optimization solutions** generating ~$50M in enterprise value.

- **Built data foundations integrating operational systems** with analytics and decision-support workflows. Improved productivity by ~5% YoY through data-driven optimization and monitoring.
- **Designed and led wireless IOT design and zone-based segmentation** & security for layers 1-3 including fiber-based automation network architectures for BPCS and IPL layers of protection, performing detailed safety and reliability analysis (PFD, TMEL, MTTF/MTTR/MTBF) and demonstrating greater than 100X reliability improvement while reducing downtime.
- **Led large-scale network modernization initiatives**, including hot cut-over transition of 200+ facilities from 2.4 GHz wireless to fiber-optic inter-connected industrial DMZ networks, implementing self-healing topologies, physical firewall segmentation, and single-fault-tolerant (1oo2+) designs, achieving TMEL greater than 1E-3 and cut-over failure rates lower than 0.009.
- **Developed and implemented advanced alarm management philosophies** using FMEA-driven grouping, dynamic prioritization, and multivariable alarm techniques, significantly reducing nuisance alarms, improving operator response to safety-critical events, increasing production uptime, and reducing operator workload.
- **Provided technical mentorship and knowledge transfer** across engineering and operations teams.
- **Designed embedded autonomous PLC-based artificial lift** and well production systems leveraging stochastic optimization, back propagation, gradient descent, and ML-based decision-making.
- **Led the development and implementation of advanced automation systems** to optimize operation, production, improve facility reliability, and enhance safety.
- **Electrical UPS battery design and specification with on-demand time calculator** for evaluation, testing, and validation.
- **Electrical design specifications for well site locations** including one lines, electrical switch rack designs, underground, cable schedules, arc flash studies and equipment labeling.
- **Electrical, Instrument, and Software FAT/SAT testing** procedures and reports developed for quality assurance to reduce cost and installation time while increasing reliability and operability.
- **Utilized data science and machine learning techniques** to analyze operational data, identify trends, and optimize processes, resulting in increased process availability and production, reduced alarm rates, and improved safety.
- **Provided technical leadership for electrical engineering** and instrumentation projects, ensuring compliance with safety standards and operational requirements with consideration for maintenance and operation.
- **Developed autonomous control systems to detect** and safely react to process deviations extending operation time and reducing inherent hazardous operations created by initiating and intermediate events.
- **Safety systems analysis, design and specification** of safety functions, IPLs and ITP development, and Toxic and flammable gas monitoring systems in hazardous areas including H2S and high LEL gas concentrations.
- **Managed project life cycles**, from requirements to FAT/SAT testing, commissioning, mechanical integrity, and operational handover.

IEC Engineer | $7B Cedar Bayou Expansion Project | ChevronPhillips (2015–2018)

- **Designed and supported instrumentation, electrical, and control systems** for large-scale chemical operations.
- **Led commissioning, troubleshooting, and lifecycle support** for automation and safety systems.
- **Applied reliability engineering and standards-based design** to improve system availability and safety.
- **Collaborated with operations and maintenance teams** to align engineering solutions with plant objectives.
- **Lead project engineer for electrical, instrumentation**, and control system design, operational readiness, SOPs, and training development on USGC 1594 Ethane Cracker $7B project.
- **Project management provided for contract exhibit** interpretation and assurance. Design of real-time monitoring, condition-based maintenance systems for reliability centered maintenance implementation.
- **Electrical power load flow, short circuit, arc flash, and motor trip characteristic studies** performed with ETAP.
- **Rotating equipment, motor and power relay setting and programming scheme** development with acSELerator software for SEL relays for zones of protection, motor start protection schemes, Power Management System remote monitoring (TCP/Modbus over Fiber optic mediums), and reporting. Electrical switchgear testing (ANSI/NETA), maintenance, and switching procedures.
- **Lead participant for ID and FD fan operational safety requirements** and interlock requirements in SRS and control and interlock narratives based on NFPA 85/ANSI/ISA77.

- **Led the Mechanical Integrity Program (MIP) implementation** for instrumentation and electrical functional areas and enhanced the evaluation process and increased process reliability. Developed and created an enhanced Reliability Centered Maintenance (RCM) program complete with selective adaptive maintenance strategy selection matrices based on conditions including criticality, FMEA, RCA, and input from a predictive data collection asset database.
- **SME in alarm management, SIS diagnostics, IPL/SIF identification**, and compliance with NFPA 85/ANSI/ISA77 for boiler, furnace, and burner safety systems.
- **Delivered advanced reliability solutions through real-time monitoring**, condition-based maintenance, and intelligent device management.
- **Testing and commissioning of major DCS/PLC platforms** (ControlLogix, Yokogawa Centum VP, Triconex, SEL, Honeywell, Foundation Fieldbus) with proven success in QA, loop checks, and unit operational readiness.

Electrical Engineer | Launch & Test Infrastructure | SpaceX (2014–2015)

- **Designed and commissioned mission-critical data center**, electrical power, and control systems supporting test and compute facilities.
- **Supported high-availability power distribution**, UPS, generators, and monitoring systems.
- **Performed onsite troubleshooting and root-cause analysis** in high-reliability environments.
- **Collaborated with multidisciplinary teams** to deliver complex infrastructure projects on aggressive schedules.
- **Led ground system design, operations, and maintenance** of automation, power distribution, instrument, and control for cryogenic nitrogen, LNG, RP-1, and LOX fuel conditioning and storage.
- **Developed novel autonomous automation systems for rocket test stands**, including cryogenic rocket fuel conditioning systems, test stand architecture and control, reactor pressure and level, and dynamic autonomous safety systems.
- **Led the development, operations, and maintenance** of automation, power distribution, and control systems at the McGregor Rocket Test Facility.
- **Ensured compliance with NASA and Space Launch range** standards for strategic alignment.
- **Developed and integrated instrumentation and control systems** for mission-critical applications, enhancing system performance and safety, including PLC programming and development.
- **Designed and installed mission critical electrical power distribution systems**, including motors, generators, automatic transfer switching, UPS, and dynamic load analysis.
- **Managed capital projects** for Falcon Heavy, Raptor, Crew Dragon, and Merlin S1/S2 test stands.
- **Developed software for SCADA systems** including PLC programming, and HMI/GUI interfaces and specified, selected, and integrated instrumentation and control systems for various applications.
- **Championed implementation of reliability techniques** for mechanical/electrical integrity and engineering design based on NASA RCM quality and reliability requirements.

Adjunct Faculty | Electrical, Instrument & Automation | San Jacinto College (2012–2014)

- Taught concepts in instrumentation, process control, PLC programming, and automation systems to technology students.
- **Developed course instruction and labs materials** which reinforced lectures in electrical theory and controls, principles of instrumentation, PID control theory and tuning, DCS/PLC programming, and automation theory & systems to technology students.
- **Lectured course topics and presentations** featuring in-depth and practical examples bridging the gap between theoretical and real-world solutions
- **Developed training & educational curriculum**s which integrated theory with hands-on industrial applications.

EDUCATION

MS, Data Science – *Texas A&M University - Victoria*
MS, Computer Science – *University of Houston - Victoria*
BS, Electrical Engineering – *Texas A&M University*
AS, Mathematics – *San Jacinto College*
AAS, Instrumentation Technology – *San Jacinto College*

CERTIFICATIONS & TRAINING

UH Data Analytics & Machine Learning Certificate – AI/ML Based Well Optimization

ISA 84 SIS Expert
*Texas Master Electrical License (**TMEL**)*
*NFPA Certified Electrical Safety Expert (**CESP**)*
*NCCER Certified Instrument Technician (**NCIT**)*
*Certified Fieldbus Technical Specialist (**CFTS**)*
Certified Honeywell Field Device Manager Programming Associate
*DHS Industrial Cyber Emergency Response Team (**CERT**) Certificate*

HONORS & AWARDS

***Top Graduate Award** - University of Houston-Victoria*
***Technical Innovation Award** – Surge Energy, Smart Systems*
***Thanx Award** – Innovation and Dedication – Oxy, New Mexico*
***Kick Ass Award** - SpaceX, McGregor Test Site*
***Electrical Design Project** – Texas A&M University*
***Phi Theta Kappa** - Honor Society*
***Phi Kappa Phi** - Honor Society*

HIGHLIGHTS & IMPACT

- Highly experienced delivering **PLC-integrated, high-reliability systems** in energy, aerospace, and AI research.
- Led teams of engineers and developers, **mentoring junior engineers into technical leaders**.
- Successfully executed projects improving **automation reliability, CI/CD processes, and system performance**.
- Deep expertise applied **AI/ML**, and large-scale engineering systems aligned with a focus on innovation in AI computing.
- **Hands-on** domain level experience in electrical, instrumentation, automation, and programming.

PROJECTS

- **Electrical** Aerospace, Data Center, Industrial, Chemical, Oil & Gas, Manufacturing
- **Aerospace** Rocket Launch and Testing design, Instrumentation, Engineering and Operations
- **Automation** CI/CD Development Testing, Commissioning, Maintenance, Operations
- **Petrochemicals** Cedar Bayou $7B US Gulf Coast (**USGC**) polyethylene
- **Multimodal** based AI vision transformer models used for process optimization and rationalization using CLIP with image and text encoders.
- **Embedded AI based** autonomous well monitoring Smart Lift gas injection optimization project.
- **Agentic AI** Smart Tank project in which autonomous monitoring and control utilized for dynamic PVT monitoring and dynamic set point and control adjusting in real-time to increase production and increase safety and reliability.
- **Intelligent Agent** development project deployed to identify product bottlenecks, abnormalities, material balancing, and self-generated or generative rule generation for pattern recognition.

CORE SKILLS

- **Automation**: Yokogawa, Rockwell RSLogix 500, Controllogix 5000, Modicon, Siemens S5, Beckhoff TwinCAT3, GE Fanuc, Triconex TS32, Texas Instruments C2000 Piccolo, Arduino Uno w/Ethernet card, Emerson DeltaV, Honeywell Experion & Safety Manager, OSI PI, IP21, Smartphone Google Android application programming, real-time digital watermarking.
- **Network**: TCP/UDP, APIs, Ethernet, Fieldbus, HART, Profibus, Modbus, fiber optics, Device net, DH+, DH485, RS232/422/485, Network Address Translators (NATs), MOXA NPort serial device servers, Ethernet-to-fiber converters (single/multi modes), Wireshark, Cisco Switches/Routers.
- **VFD**: Allen Bradley Power Flex, Omron, Siemens, Baker Hughes, Schneider, Toshiba, Texas Instruments Piccolo.

- **DAQ**: National Instruments SCXI, PXI, PCI, Fieldpoint modules DSP Texas Instruments C6748.
- **HMI**: Rockwell FactoryTalk, Allen Bradley PanelView, Invensys Wonderware, Modicon, DeltaV, Honeywell, National Instruments Labview, Yokogawa, PyQT, C++.
- **Programming**: C, C++, C#, R, Python, Java, Visual BASIC, VB.NET, DOS, Linux, SQL, Ladder Logic, Function Blocks, Sequential Function Chart, and Structured Text. Web Interpreters Jupyter Notebook, Colab, Visualization – Tableau, Spotfire, Matplot.
- **AI/ML Engineering**: Deep Learning Models (CNN,RNN,LSTM), Data Mining, Data Analytics, NLP and LLMs, Computer Vision, Image Recognition, Classification, Regression, Time-Series Models, ANNs, Decision Trees, Random Forest, Logistic Regression, Clustering, Predictive Analytics, Semantic Analysis, Artificial Process Control and Artificial Alarm Analysis
- **Libraries**: TensorFlow, PyTorch, Keras, Pandas, NumPy, Scikit-learn, MLflow, MLOps, AIOps, LLMs, BERT, GPT, CLIP, RAG, Nvidia NeMo toolkit for automatic speech recognition (ASR), Matplot, PySpark, Seaborn, Beautiful Soup, OpenCV, SciPy, Theano, MLflow, and Streamlit data visualization.
- **Compilers**: Texas Instruments TMS320C55x Optimizing C/C++ Compiler, NI LabView, Microsoft VisualStudio, Android Studio for Android Development. Additional Modeling and simulation experience with PSpice, Matlab Simulink. Code Composer Studio for TMS320C6748 DSP (Texas Instrument C6748), Jupyter Notebook.
- **Engineering**: exSILentia, AutoCAD, MathWorks MATLAB, SmartPlant, ETAP, SKM, PHAWorks/Pro, Altium PCB designer, CMMS, AMS.
- **Software & Cloud:** SCADA, PLC, RTU, DCS, Python, Linux, Bash, C++, SQL, cloud infrastructure (GCP, AWS, Azure), CI/CD, API design, Kanban, ML/AI workflows such as Databricks MLflow, Docker, Tableau.
- **Leadership & Management:** Team leadership, talent development, mentoring junior engineers, cross-team collaboration, engineering governance, knowledge transfer and sharing.
- **Pipelines:** Apache Spark, Hadoop, Pandas, Streamlit, Colab, Jupyter

PROJECT EXPERIENCE

Electrical, instrument, control and automation engineering specification and design. Software and hardware full lifecycle development featuring advanced PLC and DCS object-oriented programming methods for scalability. Proven use of data analytics and machine modeling to extract data driven insights. Large language modeling experience combined with vision transformers and computer vision both in theoretical and applied applications. Electrical transformer, motor, and switchgear monitoring with computer vision based on FLIR heat signatures. Motor and pump assembly sizing. Control valve sizing and specification. Project technical assurance and factory and site acceptability testing (FAT/SAT). Construction management, on-site start-up and commissioning testing, and personnel training. Reliability & safety practices and planning NFPA 70(b)(e). High voltage motor testing (PDMA). ESD system design according to safety shutdown list. PID closed and open loop tuning methods and calculations for optimal process performance. Probability of Failure on Demand (PFD) calculations for PHA, LOPA, SIS, and SIL determination based on ANSI/ISA-84.00.01-2004 and IEC 61508-61511. Alarm rationalization and Critical safety alarm design and identification. Electrical, instrument, and control root-cause analysis, and preventative design solutions along with maintenance and operations training on these systems. Electrical designs based on NEC and IEC codes, hazardous area classifications using API standards, and instrument specifications conforming to ISA guidelines. Experience with intelligent device and automated asset management specification, integrated with a reliability-centered maintenance approach. Calibration and tolerance methodologies with emphasis on instrumentation standards for operations and maintenance practices. SIS, IPL, and Loop function/proof test procedure (PTP) lead participant, review, and training process. Boiler/Furnace burner management systems (BMS) based on NFPA 85/ISA 77 requirements. Mechanical Integrity Program specifications and implementations for process safety management. Reliability Centered Maintenance, NASA & NAVAIR. IEEE 141, 242, 399 for Electrical Power design and protection low, medium, high voltage with switching procedures and electrical safety. Transformer sizing with impedance specifications, fault calculations with arc flash analysis. ANSI/NETA Acceptance Testing Specifications.