

Henry Essay

Saturday, October 28, 2023 12:33 PM



NREIP
Applicatio...

Career Goals

Describe your career goals and how this program would help you fulfill them. (2,000 word

maximum)*

I'm the kind of person who sees a new technology that I would have never dreamed up on my own and am instantly excited about it and want to learn more. I go and ask question after question until I feel I have a good grasp on understanding what I'm seeing and if I don't feel that way I keep digging on my own. If you could imagine it, I get pretty excited about the things I learn and try to use the creative muscles in my brain to drum up cool ways I could get involved in the technology. So with that being said, I feel like as I continue to learn and evolve in both the academic and professional portions of my career, the details and nuances of my career goals are everchanging as they adapt to new knowledge and experiences. However, certain fundamental principles remain unwavering, and I believe the path to realizing my goals is achievable through incremental learning and a commitment

to expanding my horizons. If I was to look at my career goals as of today, and probably over the past

six months or so, I would say in the next 10 to 15 years, my career goal is to work my way into a position where I can actively participate in the entire lifecycle of technology development, from its inception to practical application, all while collaborating with a team of individuals who share my passion for technology. I plan to get there by developing both my skills as an engineer over the course

This seems
vague to
you

"I often find myself intrigued and engaged by these new experiences and ask myself "How can this new technology be applied to what I am working towards?"

This is great, But
Break it into 2 sentences

I love you dude but you need to answer the question. Elaborate more on those "Unwavering fundamental principles" earlier in this essay.

Throw the phrase "Continuing to do Research" in here, I know what you're trying to get at but what you're describing is really hand-wavey

Elaborate on what branch of technology: Quantum computing? Microchips? The decomposition of trash bags?

additionally
of many years. But also I want to make sure I highlight that I understand the key to success lies not
only in my individual efforts but also in the collective synergy of a team united by the same
excitement for engineering that I have.

For the development of my technical skills to make me both an effective engineer and researcher I

Small
think it makes the most sense to break this aspiration into smaller, self-improvement focused goals.

The relationship of these smaller intermediate goals might not always be obvious how they relate to

growing from
my overall career goal and where I want to be, but these intermediate goals serve as building blocks

that will lead me in the right direction. Additionally, by focusing on self-improvement goals, I am

desirable and unique
pursuing skill set rather than a position which will allow me to pivot should my career goal change,

or more likely a new opportunity arises that my now developed skill set would fit much better. By

*allow for myself to adapt given New
Challenger*

concentrating on smaller, attainable milestones, I can approach the journey with confidence and a

sense of accomplishment, making the path to my career aspiration less daunting. These smaller goals

include learning to identifying potential research gaps, formulate effective research plans, and

acquiring technical skills in areas such as robotics, electronics, mechanical design, and manufacturing,

all of which contribute to my long-term career aspiration.

*Mention them
earlier*

As for developing skills as a researcher, I think that identifying areas where research opportunities

exist is a fundamental aspect of driving innovation in technology development. Learning how to

Where the fuck did this semicolon come from and why is he there?

effectively; read the landscape of state of the art and understanding the research trajectory of both

*You use the words "skills" and "Research(er)" a lot in this part. Try to use synonyms or work around
using these too much.*

the past and the present in different technology areas is an invaluable skill and helps to drive where the future of research will go. Oftentimes opportunities hide in the gaps and uncharted territories of existing knowledge, but by identifying these gaps, we uncover the potential for breakthroughs and advancements and even creation of new technologies, no matter what their application could be for.

These unexplored research avenues represent areas for both improving existing technologies or

creating entirely new ones. In essence, recognizing research opportunities is like discovering hidden treasures that can lead to groundbreaking developments and keep technology at the cutting edge. I

imagine the DoN laboratories where real cutting edge naval research is happening might be one of the best places to work where I could see professionals and experts in their fields identifying research gaps. I think NREIP provides an excellent opportunity for me to gain access to a work environment where this is commonplace and I would be able to sharpen that skill.

Other types of skills where NREIP would be a great place for me to learn and be exposed to would directly follow the identification of uncharted research trajectories; outlining and developing an effective research plan. Effective research planning plays a pivotal role in the realm of technology development. It serves as the foundational blueprint that guides the entire process, ensuring that the project progresses systematically and efficiently. Unplanned research is often serendipitous and leads to new interesting learnings; however, well-structured research plans, one can identify clear objectives, allocate resources judiciously, and set realistic timelines for achieving milestones. As an

This is great
Best W.A.P.

I have strong foundation
intern who spends their school year working on my own research plan, I think I have a good

working@NRL and
foundational understanding of how to lay out a plan for research. But being surrounded by many

different types of research projects, seeing and experiencing how research plans are formed and

changed and executed would give me great insight into how they play out over a larger scale.

a greater understanding
Moreover, research planning facilitates the identification of potential challenges and risks, enabling

proactive problem-solving and adjustment of strategies. It is, in essence, the compass that keeps

technological development on course towards its intended destination. An important understanding I

as well as
think I would want for my future career.

Now maybe this next idea seems obvious, but I believe the NREIP program offers a remarkable array

of hands-on opportunities that align perfectly with my goal of acquiring technical skills. Participants

in the program are immersed in the dynamic world of Department of Navy laboratories, where they

engage in real-world projects across various domains. This exposure provides an ideal environment

for skill development. Through my program in graduate school, I've already had exposure to many

concepts that an engineer should be familiar with. Robotics, industrial electronics, PCB design,

mechanical design, a plethora of manufacturing processes, and so much more. But for the

development of my engineering skills more exposure to technology and its development would both

help me learn faster and be a contributor sooner. NREIP offers access to cutting-edge robotics

laboratories, state-of-the-art electronics facilities, opportunities for hands-on mechanical design and

*I don't understand
this sentence*

*Stop Slacking
off sentences
With
Conjunctions*

prototyping, and insights into advanced manufacturing processes. These resources, combined with the guidance of experienced mentors, provide a fertile ground for me to acquire and refine the technical skills necessary to contribute meaningfully to technology development initiatives.

Overall, My commitment to creating an enthusiastic research team is unwavering, driven by my desire to collaborate with like-minded individuals who share my passion for technology. The NREIP program offers a unique opportunity to cultivate a network of passionate peers who are equally dedicated to advancing their STEM careers. By actively engaging with fellow participants, sharing insights, and collectively tackling challenging projects, I aim to forge strong connections and lasting collaborations. Should I be selected to be apart of the NREIP program, I plan to foster motivation and enthusiasm among my peers by encouraging open communication, providing support when needed, and sharing my excitement for technological innovation. Through active participation in NREIP projects and sharing experiences, I aim to inspire and motivate my colleagues, creating a dynamic and uplifting atmosphere that empowers everyone to excel in their research pursuits.

I really do believe the NREIP program aligns seamlessly with my overarching career goals by offering a multifaceted pathway towards skill acquisition, research experience, and a vibrant community of like-minded individuals. I am genuinely enthusiastic about the prospect of participating in NREIP, as it provides an invaluable platform for personal and professional growth. It offers the chance to learn, adapt, and thrive in a supportive environment, all of which are instrumental in my pursuit of a career

dedicated to shaping the future of technology. I am eager to embrace the opportunities within NREIP, confident that they will propel me closer to my long-term career objective while fostering a passion-driven journey of exploration and discovery.

Overall you need to be more specific with your career goals. I like the direction you went with this, but you need to have a sentence that you can point to and sum it up that way.

Academic Interests

Describe any special interests you have that would make you a valuable participant. (2,000 word maximum)*

My academic journey in STEM-related fields and technologies has uniquely positioned me as an ideal candidate for the NREIP program. However, it's crucial to look beyond my current academic interests and understand how my evolution as a student and my deliberate pursuit of new academic avenues have shaped my educational path in recent years.

Great
inter

My academic interests have organically grown in parallel with the development of my skills, a subject I've explored in another section of this application. What's evident is that my academic pursuits have harmonized seamlessly with my personal passions, a trend that has persisted over many years. As I

I think
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vague

Pursuing a degree in

embarked on higher education, majoring in mechanical engineering, my academic interests naturally divided into two distinct phases.

State the phases here

The first phase of my academic journey was marked by a profound fascination with cars and automotive manufacturing. This interest is a common thread among mechanical engineering students, and it was particularly prominent during the initial phases of my education, primarily within my first and second years of college. Topics such as CAD design, design for manufacturing, numerical analysis of structures (including finite element analysis), and instrumentation held my attention. During my freshman year, I joined the Baja design team at my school, providing me with invaluable hands-on experience. I had the opportunity to work on a project involving the instrumentation of accelerometers for a team-designed dynamometer. This experience not only introduced me to CAD software but also honed my critical thinking skills, an essential component of engineering problem-solving. Reflecting on this experience, I am profoundly grateful for my involvement in academically sponsored clubs that complemented my coursework. They not only exercised different cognitive faculties but also instilled in me the ability to seek out resources beyond the classroom, fostering self-directed learning.

also
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Many

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in what
Baja is

on-Dash

More recently, my academic interests have gravitated towards the realm of advanced manufacturing, a broad domain that can be distilled down to the use of innovative manufacturing techniques in conjunction with robust data processing and analysis methods. The aim is to supplement the existing supply chain or introduce novel technologies to industries, filling gaps that traditional manufacturing processes cannot address. In my current role within a research lab, we primarily focus on additive manufacturing, with my specialization being directed energy deposition. This additive process entails the localized deposition of energy and feedstock, patterned in a 1D dimensional deposition to create individual layers of a part. These layers are subsequently stacked to form 3D objects. A unique aspect of this advanced manufacturing process is the presence of high thermal gradients and significant variability in final dimensions. These characteristics make it an excellent candidate for instrumentation and monitoring through advanced manufacturing techniques.

Driven by my fascination with the technology's potential and the notable gaps I perceive in the current manufacturing process that can be supplemented by advanced manufacturing techniques, I have embarked on a journey to pursue a Ph.D. in this field.

My interest in advanced manufacturing, particularly additive manufacturing, is further fueled by the pressing demand for replacement parts and legacy components across various industries in the United States. The discontinuation of old casting infrastructure in the U.S. has disrupted the supply chain for parts, making additive manufacturing a viable solution to bridge these gaps.

This request

candidate for an

As an NREIP intern, I believe that my academic interest in this facet of the current supply chain can be particularly impactful in a Department of Defense (DOD) application. The military supply chain plays a pivotal role in ensuring the robustness and effectiveness of the U.S. military presence on the global stage, making any enhancement in this area of utmost importance.

With the rapid integration of new data processing technologies and artificial intelligence (AI) into various aspects of our world, I see my interests in advanced manufacturing as a valuable addition to many NREIP projects. In pursuit of these academic interests, I plan to take courses in advanced instrumentation and data signal processing. These courses will equip me with the skills to effectively instrument advanced technologies using novel sensing techniques, thereby improving the accuracy and efficiency of data collection for various applications. Additionally, I will delve into AI, gaining a

Don't outright
say this, elaborate on
it saying you have an interest

fundamental understanding of AI and machine learning algorithms. This knowledge will empower me to harness these powerful tools and make informed decisions about when to utilize them.

we gotta
Clean this up Bro

In conclusion, my evolving academic interests have provided me with opportunities for learning and growth throughout my educational journey. The interests I have pursued thus far align me well with potential NREIP projects. Looking ahead to the future of my academic career, I have a well-defined plan in place to continue pursuing these interests. I am optimistic that the NREIP program and future DOD projects will provide me with opportunities to expand my knowledge and explore new and exciting technologies, should my interests continue to evolve in tandem with my personal and academic growth.

Research Experience

Describe any research experience you may have in relation to this program, including any STEM afterschool programs, camps, or competitions in which you have participated. (2,000 word maximum)*

Over the past four years, my research endeavors have encompassed a diverse spectrum of projects, ranging from human subject research focusing on engineering education applications to intricate modifications and advancements in additive manufacturing systems. A recurring theme in these projects has been my unyielding commitment to in-depth exploration, seeking a comprehensive understanding of the subjects under investigation.

My initiation into the realm of research coincided with the challenging circumstances brought about by the COVID-19 pandemic during my junior year of undergraduate studies. As I witnessed the educational landscape transition to online platforms, it sparked my interest in the tools that could facilitate seamless collaboration and enhance remote work for engineering teams. To pursue this, a fellow student and I co-authored a research proposal, which we presented to a professor in the engineering education department. This proposal received sponsorship for a three-year research project, marking my inaugural research experience.

Can you talk more on this

This first project in research ignited my passion for further exploration and subsequently led me to my current pursuit of a Ph.D. in mechanical engineering within the DREAMS Lab. During my tenure

Move this here, it's a little confusing

in this lab, I have engaged in a wide array of projects, including the development of a multi-modality 3D printer, robotic laser welding, and the modification of a hybrid wire arc additive manufacturing machine.

Several years ago, I embarked on a research journey focused on engineering education. This initiative aimed to assess the efficacy of specific online tools for engineering education projects, enhancing collaborative teamwork among students. The success of students in staying organized and their performance in teamwork metrics were meticulously analyzed as they utilized various online tools for communication and collaborative project tasks. My motivation for this project stemmed from a keen interest in the evolving landscape of collaboration, particularly in the post-COVID era, where tools like Zoom, Dropbox, and Microsoft Teams have gained prominence, making remote work a standard practice for many engineers. The experiment revealed the effectiveness of certain tools for

explicitly

tools like Zoom, Dropbox, and Microsoft Teams have gained prominence, making remote work a standard practice for many engineers. The experiment revealed the effectiveness of certain tools for remote collaboration while highlighting challenges related to cost and cloud service availability in an educational setting. Beyond the outcomes of the study, the research experience enriched me with essential skills. I honed the art of crafting well-defined research questions and constructing comprehensive research plans, providing insights into the rationale behind observed results. The development of experimental plans and data processing methods has proven to be an invaluable asset throughout my academic journey.

Explicitly state what worked

Following this initial research exposure, my senior year brought new opportunities. While continuing my work on the engineering education project, I joined our school's additive manufacturing lab, known as the DREAMS Lab, which stands for Design Research and Education in Additive Manufacturing Systems. Here, I engaged in diverse projects. Notably, I was tasked with designing and fabricating a direct ink write head capable of operating under elevated environmental temperatures while effectively managing material temperature. This project instilled in me the ability to identify technological gaps in existing literature and understand the direct ink write process. It also provided me with insights into the influence of heated chambers on the thermal profile of the printing process. Armed with this knowledge and a clearly defined problem statement, I embarked on the endeavor to create a new multi-modality heated environment printer. This experience not only heightened my enthusiasm for undergraduate research within the DREAMS Lab but also led me to contribute to another project centered on conformal carbon fiber compaction. Proposed by an external company, this project enabled me to work on a controls project that incorporated robotics and carbon fiber layup. The project deepened my understanding of robotics and imparted knowledge in controls and mechatronics principles, which I continue to leverage in my current research. This experience, though rooted in engineering, unveiled the diverse range of opportunities and technologies available for further exploration within the DREAMS Lab, should I choose to pursue graduate studies.

You're really good at writing when you know what you're talking about

Motivated by this newfound inspiration, I applied for a master's program at Virginia Tech, continuing my research journey within the DREAMS Lab. This phase of my academic journey introduced me to *done in the same* Wire Arc Additive Manufacturing (WAAM), a metal 3D printing process closely related to welding.

Prior to graduate school, I had no experience in metal additive manufacturing, making it a novel challenge in an unfamiliar domain. However, my prior experiences, including the development and execution of research plans through my engineering education project and work within the DREAMS Lab, provided me with a solid foundation for success in graduate-level research. I embarked on an extensive literature review to comprehend the intricacies of the technology, typical processing conditions, and areas where knowledge gaps existed. This review enabled me to shape my research scope and define my contribution within the WAAM research landscape, demonstrating the cumulative growth of my research skills.

At present, my research focuses on examining how the thermal history of a part impacts grain growth when employing specific build strategies in WAAM. I firmly believe that my prior research *state what you are* experiences have endowed me with the capabilities essential for effective research, an asset that would greatly benefit me as an NREIP intern. I bring to the program a robust background in developing strategies for uncovering new research opportunities, identifying gaps in existing research, and formulating well-structured research plans. Moreover, I recognize the numerous opportunities within the NREIP program to apply my research skills, including literature review,

project proposal and reporting, and unwavering attention to detail in research execution. My extensive background positions me well for success within the program.

Technical Skills

Describe any technical skills you may have which are related to the science and engineering disciplines. (2,000 word maximum) *

Engineering skills are the product of a complex blend of critical thinking, unwavering determination, and a well-rounded technical prowess. The crux of these skills lies in the ability to analyze problems critically, persist through challenges, and adapt to learn new skills and concepts when the need arises. While critical thinking and grit are the cornerstones, the technical side of engineering and scientific knowledge, when cultivated effectively, can significantly expedite the engineering and research processes. The development of these technical skills is not just a part of my academic journey; it's a lifelong passion that has shaped me into the engineer and researcher I am today.

My affinity for technical skills began early in life, driven by an insatiable curiosity to build and understand how things functioned. Long before I stepped into a college classroom, I embarked on a multifaceted exploration spanning various domains, including electronics, metalworking, automotive, and woodworking. These early experiences laid the foundation for my educational and professional

you can say "I pursued projects that I thought were fun"

endeavors. Crafting Halloween costumes from scratch using cardboard, tape, and household items

was just the beginning of my hands-on journey. Beyond costumes, I tackled more complex projects,

such as constructing air cannons, water guns, and even potato launchers. These ventures led me to

explore the principles of gas expansion, water pressure, and fluid flow restrictions. Through

experimentation and perseverance, I acquired skills in soldering and circuitry.

try an early age

*or the basic set of tools
at the end*

My high school years marked a pivotal stage in my development. Like many young enthusiasts, I

became engrossed in automotive technology. I delved into engine mechanics, suspension systems, and

sensors, providing me with profound insights into the intricacies of mechanical systems. This

practical knowledge laid the foundation for much of my engineering skill set, and I found myself

further inspired to explore the vast and evolving world of engineering.

*) Mention
) the deeper*

These experiences were instrumental in preparing me for college, where I transitioned from hands-

on projects to a more theoretical understanding of engineering concepts. I engaged with subjects like

control theory, material science, thermodynamics, fluid dynamics, and numerical methods. These

theoretical underpinnings not only complemented my practical skills but also provided a deeper

understanding of the principles governing the technologies I had explored earlier.

) Say what specific skills

With an automotive background and a few years of university education under my belt, I eagerly

embarked on my first internship, working with a small company specializing in semi-truck

modification. This experience introduced me to the world of welding, machining, and CAD/CAM software. It was my first exposure to Autodesk Inventor, a new software for me, as my prior projects predominantly utilized SolidWorks. During this internship, I honed my skills in pneumatics and air pressure control for non-electrical systems. I also delved into the development of wiring harnesses designed to function within the capabilities of the stock software running on the trucks. These projects were not only a practical application of my skills but also a window into how technical skills could be applied in real-world engineering and scientific contexts.

Subsequent years in school saw my participation in an interdisciplinary capstone design class, which involved industrial robotics. The project aimed to automate monotonous and unnecessary tasks, alleviating workers from repetitive labor. In the context of industrial robotics, I gained substantial experience in robotics, computer vision, and closed-loop control systems. This project served as an opportunity to refine my skills in PCB design, C++ programming, and Python coding. Material selection for the robotic end effector was another dimension of the project, emphasizing the importance of materials science in practical engineering. The project was a comprehensive showcase of my technical skills, particularly in controls, microcontroller wiring, and programming. It was during this project that I was exposed to different types of robot toolpathing solutions, which led to my burgeoning interest in inverse kinematics, an area I'm actively working to develop as a technical skill.

In my present endeavors, I've found myself at the cutting edge of technology. My work in an additive manufacturing lab has provided me with a platform to refine a cross-section of technical skills relevant to additive manufacturing and research. Additive manufacturing research is a captivating realm, especially when I'm involved in the design and construction of the very machines we use for research. Here, I'm tasked with mastering mechatronics and controls programming to not only build but also modify our lab equipment as needed. Additionally, understanding the intricacies of materials processing is vital in the additive manufacturing field. As we repeatedly deposit and build materials, my research delves into how material processing affects the mechanical performance of the built parts. Furthermore, there are the challenges of CAM (computer-aided manufacturing) and robotic toolpathing, requiring a deep understanding of both the machines' capabilities and the functionalities of CAM software. This ensures that experiments using the machines are designed and executed successfully.

In the context of my research, extensive data processing and statistical analysis play a pivotal role. Python programming forms the backbone, allowing me to synthesize and present results in a clear and concise manner. Moreover, I've ventured into the realms of machine learning and artificial intelligence, harnessing these tools to expedite my research. Using machine learning algorithms like support vector machines, random forest trees, and neural networks, I seek to identify trends and establish connections between physical phenomena and the data generated by our lab equipment.

While I am still in the process of developing these technical skills, my understanding of machine learning and its application in a technical context continues to grow daily.

Having cultivated a broad technical skill set has been instrumental in my journey as a successful engineer and researcher within the educational sphere. Yet, my thirst for knowledge and the inherent challenges in engineering and science keep me eagerly exploring new horizons. With an ever-growing skill set, I eagerly seize opportunities like NREIP, which expose me to new environments, intricate technical challenges, and the company of creative and seasoned engineers.

These experiences not only enrich my knowledge but also push me to develop new and formidable skills that I can apply to my research and engineering in the future. As I embrace these opportunities, my journey as an engineer and researcher continues to evolve, leading me down exciting paths of innovation and discovery.