Keshav Anand — Wright Application

1. Applicant Information

Required Information:
- First Name: Keshav
- Middle Name: Gopalan
- Last Name: Anand
- Scholar Email Address: keshavanandofficial@gmail.com
- Street Address: 3809 Sagewood Court
- City: Plano
- State: TX
- Zip Code: 75025
- Scholar Phone Number: (972) 520-4390
- Date of Birth: 07/03/2009 (MM/DD/YYYY)
- City, State, Country of Birth: Plano, Texas, USA
- US Citizen?: Yes

Optional Information:
- How did you learn about this program?: School or college counselor
- Gender: Male
- Race: Asian
- Disability: N
- Languages: Hindi, Other (Tamil)
- First Gen College: No

Required School Information:
- HS Name: Plano East Senior High School
- HS City: Plano
- HS State: Texas
- HS Phone:
- College Name(s) if accepted: MIT, CalTech
- Planned Program of Study: Computer Science

2. Applicant Certification and Commitment

Nothing to do here

3. Essay Section

- Current Grade: HS Junior
- HS GPA (Cumulative Unweighted): 4.0/4.0
- HS GPA (Weighted [Unspecified Cum or Not]): 4.73
- Planned Program of Study/Career Path: Computer Science

Prompt 1: List the five most advanced science and math courses you have taken or are taking in high school and the grade received if completed (AP , Honors, College-level and label as such). Include any engineering tech prep program classes that you are enrolled in at your school.

Science and Math Courses

1. Calculus III (Collin College): 99% (11th Grade Semester 1)
2. AP Chemistry: 99% (11th Grade Semester 1)

3. AP Calculus BC: 98%, 98% (10th Grade Semesters 1,2) — AP Exam 5/5
4. AP Physics 1: 97% (11th Grade Semester 1)
5. AP Environmental Science: 97%, 97% (10th Grade Semesters 1,2) — AP Exam 5/5

Engineering Tech Prep Program Courses

1. AP Computer Science Principles: 100%, 99% (9th Grade Semesters 1,2) — AP Exam 5/5
2. PLTW Introduction to Engineering Design: 97%, 99% (9th Grade Semesters 1, 2)
3. PLTW Engineering Science 98%, 98% (10th Grade Semesters 1, 2)
4. PLTW Digital Electronics 97% (11th Grade Semester 1)

Prompt 2: List participation in extra-curricular high school activities such as athletics, band, choir, orchestra, National Honor Society, school newspaper/yearbook, school officer, or any home school extracurriculars.

1. **First Tech Challenge (FTC) Robotics, Co-Captain, Software Lead** (9th–11th Grade): Co-captain for a community robotics team with fully custom robot design and software. Won multiple local awards for software and hardware innovation, becoming a regional and state finalist alliance team and ranked top-30 globally for the autonomous section. Mentored over 200 students across various platforms.
2. **Simply Stir Research Project** (9th Grade): Completed independent research on harvesting thermal energy to power a self-stirring pot. Won 1st place in Engineering Technology at regional science fair, within the top 9 overall projects ($300). Also won US Metric Association Best SI Units and US Air Force Certificate of Recognition. Advanced as a finalist to the International Science and Engineering Fair (ISEF).
3. **Gait Guardian Research Project** (10th Grade): Completed independent research on using machine learning and signal processing for Parkinson's Disease patients. Won 1st place in Systems Software at regional science fair and 2nd Grand Prize Overall ($400). Won TI Best Computing Project, and advanced as an ISEF finalist. Won 3rd in Robotics and Intelligent Machines at ISEF ($1200).
4. **School Science Fair Club, Officer** (10th–11th Grade): Served as Underclassmen President and later as Vice-President of the school's science fair club, organizing meetings, mentoring new members, and leading STEM outreach events in the local community. Conducted biweekly lunch meetings to guide students through project ideation, research methods, and presentation skills.
5. **Speech and Debate** (9th–11th Grade): National (NSDA) and State Quarterfinalist in Impromptu Speaking; National Octofinalist in Extemporaneous Commentary. Won local and regional tournaments in Duo Acting and Extemporaneous Speaking. Developed a custom timer utility and Congress presiding officer app used by state and national competitors.
6. **Keyboardist for Local Band** (9th–11th Grade): Performed as a self-taught keyboardist in a local band with ticketed shows and millions of views on YouTube. Donated performance revenue to charity, raising over $200,000 to support medical expenses. Volunteered more than 100 hours and earned the President's Volunteer Service Award (Silver).
7. **Original Music Arrangement and Composition** (9th–11th Grade): Composed and arranged original film music using self-taught skills in music production, keyboard, and bass guitar. Collaborated with local artists and a renowned Tamil film music composer.
8. **NSDA Certified Debate Judge** (9th–11th Grade): Judged local Middle School debate tournaments in a fair and unbiased manner. Judged events include Extemporaneous Speaking, Congressional Debate, Public Forum Debate, Duo Interpretation, Dramatic Interpretation, and Original Oratory.
9. **ACE Tutoring Officer** (10th–11th Grade): Tutoring officer for Calculus and Math in 10th grade, and Chemistry in 11th grade. Published study material and practice tests for studying students, and hosted live review sessions for live Q&A. As officer, managed other guides to ensure that resources are top-quality.
10. **NHS Technology Officer** (11th Grade): Served as Technology Officer for the largest NHS chapter worldwide. Built a React-based full-stack web portal to streamline member management, event coordination, and service hour tracking using QR codes and a Firebase database.
11. **National Honor Society (NHS) Member** (10th–11th Grade):
12. **Math Club** (9th–11th Grade): Competed in local math competitions, including AMC 10/12 and AIME (1× qualifier).

13. **Founder of School's Cricket Club** (11th Grade): Founded and organized the school's first competitive cricket club, coordinating practices, matches, and logistics. Expanded participation to over 30 members and introduced 15 new players to the sport.
14. **Owner of Class Discord Server** (9th–11th Grade): Founded and managed a class Discord server for studying and resource sharing. Supported over 150 active members with structured subject channels, live study sessions, and teacher-supported moderation.

Prompt 3: Provide 3 or more detailed examples of demonstrated leadership (team captain/class officer/scouts/running a lawn service/leading fund raiser/tutoring/community service/volunteer work). Explain your duties.

1. I am the founder and president of the Cricket Club at my current high school. I identified a gap in our school's athletic program and built the Cricket Club into a sustainable organization with over 25 active members. As the founder, I marketed the club through Instagram campaigns and personal networks to recruit members. I planned and implemented biweekly practices while serving as both a player and coach, helping new members overcome the sport's steep learning curve. This required coordinating schedules and logistics for more than 25 members per practice. As a first-year organization, I also worked to bridge the skill gap between experienced players and beginners to ensure an inclusive and enjoyable experience for all members.
2. I serve as Co-Captain and Software Lead for my school's First Tech Challenge (FTC) Robotics team. As the sole programmer on our initially rookie team, I developed the entire competition robot codebase from scratch. When funding became a challenge, I secured a $750 sponsorship from Texas Instruments through multi-faceted outreach. As the team expanded, I recruited new members based on programming and engineering needs. Once the team grew to five programmers, I restructured our workflow by creating a GitHub organization with multiple repositories to support collaboration and version control. I delegated tasks and managed development timelines, and I led documentation of software iterations and technical innovations that contributed to winning the Innovate and Control awards.
3. I serve as Vice President (and former underclassmen president) of my school's Science Fair Club. I lead biweekly lunch meetings for over 90 active members, collaborating with fellow officers to design engaging activities and delivering 35–40 minute presentations on key aspects of science fair projects. I have developed instructional materials covering project brainstorming, methodology, data analysis, and trifold design. I also provide one-on-one mentorship via email and in-person consultations, helping students navigate project decisions based on my competition experience. Drawing from my own initial intimidation with the process, I design presentations to lower the barrier to entry and make science fair more accessible to new students.
4. From halfway through my 9th grade to the present, I have founded, owned, and maintained a Discord study server for my school's class of 2027. As the server owner, I oversee eight democratically elected moderators and have implemented systems to ensure all members have a voice in decision-making. Because online disputes can escalate quickly, I frequently act as a neutral arbitrator to mediate conflicts. I have invested over 300 hours into managing the server, which at its peak supported over 50% of the student body and more than 100 active members.
5. I serve as the Chemistry Officer (and former Math Officer) for my school's tutoring club, ACE. My primary responsibility is supervising student volunteers who create Chemistry review materials by delegating units and topics and reviewing all resources for accuracy and clarity. I also organize and monitor live AP Chemistry tutoring sessions, both in person and via Zoom, serving 20–30 students per session. My most demanding responsibility is stepping in to complete unfinished materials or host sessions when volunteers are unavailable, requiring flexible availability to ensure uninterrupted academic support.
6. I serve as the Technology Officer for my school's National Honor Society chapter. In addition to managing technical responsibilities, I moderate service events involving over 200 student volunteers, overseeing participant behavior and ensuring effective execution of service activities. I also represent my chapter at leadership conferences such as LEAD, where I collaborate with officers from other NHS chapters to exchange and develop leadership strategies.
7. In my freshman year, I served as an officer for my school's Math Club. I presented approximately one-quarter of weekly meetings to over 15 students, designing and delivering engaging lessons on mathematical applications such as card tricks and calculator programming. I was also responsible for maintaining detailed attendance records to track eligibility requirements for the Mu Alpha Theta honor society.

Prompt 4: Provide detailed examples from high school that showcase your interest or participation in STEM platforms, such as FIRST Lego League, robotics competitions, science fairs, Science Olympiad, Math Olympiad, science/math clubs, 4-H competitions, etc. If your school does not offer these, provide detailed information on other hobbies/activities that demonstrate your interest in STEM, such as working with mechanical or electrical devices, building computers as a hobby, programming/coding skills, volunteering at a medical center, tutoring science/math, etc. Provide specific information that demonstrates your skills and capabilities in your area/s of interest.

In the last three years, STEM activities have been the focus of my high school experience, both through and outside of school. I have had a strong passion towards STEM activities since middle school, and I believe that these experiences have prepared me to fully utilize the research platforms and opportunities provided by AFRL.

1. From 9th to 11th grade, I served as Co-Captain and Software Lead for my community's First Tech Challenge (FTC) Robotics team. Beginning freshman year with no programming experience, I taught myself Java through the FTC SDK and progressed to developing fully functional robot code that contributed to our team reaching the State Finals and winning the Area Innovate Award for a fully automated hang mechanism. Over the following two years, I significantly deepened my technical contributions. By applying calculus concepts learned in the classroom, I engineered a custom autonomous pathing system using trigonometry, inverse kinematics, and PID control to achieve precise robot movement. I also developed a custom TensorFlow object detection model, achieving a 100% match success rate across all competitions. These innovations helped our team win our league championship, captain an Area Finalist alliance, and rank in the global top 30 for autonomous performance.
2. In 9th grade, my independent Science Fair research project qualified as a finalist at the International Science and Engineering Fair (ISEF). The project originated from a simple idea: using waste thermal energy from a cooking pot to power a mechanical stirring system. Through this process, I learned about thermoelectric generators (TEGs) and the Seebeck effect. Applying CAD and simulation concepts from my engineering coursework, I designed an aluminum enclosure integrating a TEG, heat sink, and motor to convert thermal energy into mechanical motion. I also developed an electrical measurement system using voltage and current sensors to analyze system performance relative to temperature differentials. My prototype won 1st place in Engineering Technology at my regional science fair, along with special awards from the U.S. Metric Association and the U.S. Air Force Certificate of Recognition. At ISEF, I presented my work to professors and domain experts from around the world and received valuable feedback to further refine my design.
3. In 10th grade, my Science Fair research project earned 3rd place in Robotics and Intelligent Machines at the International Science and Engineering Fair (ISEF). Motivated by relatives affected by Parkinson's Disease, I explored machine learning approaches for gait and tremor analysis. Using publicly available datasets, I designed a novel signal processing pipeline capable of accurately classifying gait patterns with low inference latency. After training and validating multiple models, I expanded the project by developing a physical prototype. With guidance from my engineering teacher, I designed a custom PCB featuring an ESP32 microcontroller and an IMU sensor capable of performing real-time inference. Through independent study of academic literature and online resources, I taught myself Python and C++ to fully implement the system. Initially recognized at the regional level, the project won 1st place in Systems Software, the TI Best Computing Project Award, and 2nd Grand Prize, qualifying me for ISEF for a second year. At ISEF, it earned 3rd place in Robotics and Intelligent Machines and a $1,200 award.
4. This year, I maintained a full-time home server by repurposing a decade-old laptop with Ubuntu Linux. Through hands-on experimentation, I self-learned bash scripting, networking, Linux administration, and service management. I deployed a Matrix messaging server for student communication, a Git server for code hosting, and an SSH service with a custom interactive shell displaying my portfolio. Despite over one million automated attacks within two months, my hardened security measures prevented any successful intrusions, providing me with practical experience in networking, cybersecurity, and infrastructure management.
5. In 9th grade, I qualified for the American Invitational Mathematics Examination (AIME) through the AMC 10. By self-studying with online resources, I developed strong problem-solving skills focused on logical reasoning, speed, and optimality. I participated in and placed at various competitions, including Purple Comet and Math League. I also contribute solutions on the Art of Problem Solving (AoPS) forum using LaTeX to clearly communicate my reasoning. Additionally, I have created Geometry and Calculus problems for use in my school's ACE tutoring club.
6. In 10th grade, I created a real-time audio visualization system for live musical performances. I developed a Python pipeline that converts MIDI input into audio using a piano VST, then processes the signal with the `librosa` library to visualize frequency components via Fast Fourier Transforms. By leveraging MIDI's

low-latency input, the system achieves near-instant visual response, enabling live performers to produce professional concert visuals without expensive hardware or post-production software.

7. In 10th grade, I developed a debate utility web application using React and TypeScript to address inefficiencies in tournament operations. The platform includes precise timing software with graphical notifications and audio alerts, as well as an automated presiding officer system implemented using the WebSocket API to ensure real-time synchronization among moderators and participants. The application has been tested, used, and positively reviewed by national finalists and members of my school's debate team.

Prompt 5: Describe any paid or volunteer work experience and include your responsibilities. Provide examples of strong work ethic (such as no unexcused absences or reprimands, completes assigned tasks, works well with others, etc). If no formal work experience, provide detailed description of the effort involved in a major school project (include grade awarded, teamwork involved, how you overcame challenges).

1. I have been working for a local ticketed nonprofit band for three years as a Keyboard player. As a musician, I am expected to fully practice my parts individually to a level of near-mastery. Each concert will demand at least 3-4 section practices, where I have to coordinate with other musicians in my section to ensure that we are in sync. Teamwork is a relative struggle, and each of us has differing opinions on the best way to play a specific piece. I have learned to offer my input respectfully and to avoid heated arguments by focusing on the music itself. Full band practices are also held for each performance, where attendance is absolutely mandatory. Each musician contributes to the final song, and missing a practice would lead to a lack of cohesion in the final performance. In this band, I ensure that I attend every practice and performance, and I have never had an absence or reprimand. Although our final work is paid through ticket sales, all revenue is donated to local charities, and I take pride in knowing that my work is helping those in need.
2. For three years, I have been an NSDA certified judge, judging Middle School Debate tournaments in my local area. My duties include evaluating debaters on argumentation, speaking style, and providing constructive feedback to help them improve. Each tournament lasts a full day, and I am expected to judge numerous rounds (at times six or more) with minimal breaks. Not only do I have to maintain focus and attention throughout the day, but I also have to judge impartially, as not doing so would completely undermine the integrity of the tournament. After updating availability, I cannot drop out of a tournament or a round, as the tournament relies on a planned agenda to run smoothly. My greatest hurdle has been setting aside my own political bias, as I have heard numerous speeches and arguments supporting views I both strongly agree and disagree with. I overcame this challenge by shifting the criteria at those times to the efficacy of argument and speaking style, rather than the content itself. Outside of judging I am responsible for for writing topics for each tournament, reviewing all updated rules and topics, and reporting behavioral incidents. Overall, I have judged over 50 rounds of debate without a single absence, and I hope that I have been a fair adjudicator of the activity I love.
3. For the last three years, I have been tutoring in math and science on and off. I initially started tutoring competition math to middle schoolers through my own paid company I had started when in middle school. The tutoring service was unique, offering a problem-based approach instead of a topic-based approach, prioritizing problem-solving skills and critical thinking. As I was the only person running the tutoring service, I had to find my own clients, schedule sessions, and prepare lesson plans. Halfway through my ninth grade, I only had one customer, so I decided to pivot my skills to instead offer free tutoring to my peers in my high school. Through my school's ACE tutoring program and my own study Discord server, I have been able to help numerous students in Calculus, Chemistry, and even history. Each session requires significant preparation, as I have to explain the concepts in an intuitive manner that struggling students can understand. So far, I have received positive feedback from my students, and I always prioritize their learning and understanding above all else.
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Wright Scholar Essay (Topics 1 and 3)

28 Squiggly red underlines. Nearly every line of my code had errors. Null pointers, incompatible types, undefined variables, Gradle sync errors: I had encountered them all. It was February 2024, my freshman year, and we had ten minutes to take the field for our First Tech Challenge (FTC) League Finals. My heart pounded as keys clattered beneath my flying fingers. My code was broken, and for the finals, it had to work. The merciless clock ticked away, and with seconds to go, I finally compiled the code. There was no time to test, hardly any to breathe. We took the field, and my finger hovered over the play button. Time paused. The buzzer sounded, and I pressed play. Success. In two minutes and thirty seconds, we won.

Seven months earlier, I didn't know what a variable was. I was fully into music, and programming was yet to cross my radar. When my friend started a robotics team, I joined on a whim. It was that abrupt decision that started my journey into robotics. Progress was painstakingly slow; it took me two full months to make a motor turn. But gradually, I became hooked. Like a sponge, I absorbed everything: tutorials, documentation, and even Stack Overflow threads. Eventually, I taught myself enough Java to become a functional FTC programmer.

As the season progressed, we became a competitive team, and my knowledge was expanding in parallel. On that competition day, something just clicked. It wasn't the win that truly made me happy. It was the realization that my own code produced tangible outputs. At that very moment, I knew that I wanted to continue working in a STEM field, and I was ready to keep coding on.

But that readiness was tested in September 2024. Somewhat naively, I decided to build a machine learning model to predict gait patterns in Parkinson's Disease for my sophomore-year Science Fair project. The only problem is that I had no clue how. So I dove in: Python syntax, NumPy arrays, signal filtering, feature extraction, and model architectures. I had entered unfamiliar territory, and each concept I learned brought new confusion. After two months of relentless reading, coding, and debugging, I managed to transform raw sensor data into a working classification model. Somewhere between the first error message and the final 96% accuracy, I had begun to absorb a new discipline.

I could have stopped there, but I realized that a working model on my laptop wasn't going to help any Parkinson's patients, and I needed to embed my model into a complete hardware device. This task was beyond daunting, as I had to venture into the foreign territory of hardware and electrical engineering. With my engineering teacher guiding me, I eventually learned the basics. After countless 2 AM KiCAD tutorial sessions, I finally had a working design for a custom printed circuit board (PCB) housing a sensor and microcontroller. Two weeks later, my PCB arrived, and after soldering all my components, it didn't work. My heart sank. In desperation, I resoldered each joint carefully and tried again. Somehow, it worked. After writing some C++ software for the device, I had something that actually worked. The project eventually made it to the International Science and Engineering Fair (ISEF), placing 3rd in Robotics and Intelligent Machines. What struck me most wasn't the placement, but the fact that six months earlier, I wouldn't have understood any of it.

Throughout high school, I've taught myself many disciplines, from FTC programming in Java to designing circuits. The Wright Scholar program provides an opportunity to apply my skills to current and critical research. I'm intrigued by AFRL's Sensors Directorate, where I hope to deepen my understanding of signal processing while contributing to sensor exploitation technologies. I'm equally drawn to Human Performance Wing's work with multimodal sensing to monitor and enhance human performance. Moreso, the chance to work alongside domain experts who can accelerate my growth as an engineer and developer is invaluable to me. Whether working with sensor fusion or biomedical sensing, as a sponge eager to learn, AFRL is exactly where I need to be.