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.

- **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.
- **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).
- **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).
- **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.
- **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.
- **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).
- **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.
- **National Honor Society (NHS) Member** (10th–11th Grade): Volunteered by judging middle school debate tournaments, organizing school-wide service events, and tutoring underclassmen in STEM subjects. Produced educational resources in Calculus and Chemistry through the school tutoring program.
- **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.
- **Math Club** (9th–11th Grade): Competed in local math competitions, including AMC 10/12 and AIME (1× qualifier).
- **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.
- **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 founded the Cricket Club at my current high school. As a founder, I was responsible for popularizing the club itself by recruiting members and advertising through Instagram and word-of-mouth. I organized practice sessions and I had to act as both a player and a coach, teaching new players the rules and pushing them through the sport's steep learning curve. Each practice itself proved a hurdle, as I had to find enough people to play at a common place and time, manage equipment, and ensure that everyone was engaged. Due to the nature of a first year club, I had to help bridge the high delta between experienced and new players, ensuring that everyone had fun while still being challenged. Then, I had to organize matches with other local high school teams, which involved coordinating with their club leaders, arranging transportation, and managing logistics. Through sponsorships from local businesses and colleges (UTD, RICE, DBU), I was able to fund equipment and provide support for club matches.
2. I serve as the Co-Captain and Software Lead for my school's First Tech Challenge (FTC) Robotics team. As the only programmer of our initially rookie team, I was fully writing out every line of code for our robot. However, funds became a major hurdle, so I also filled in to help secure a $750 sponsorship from Texas Instruments through outreach events. As our team grew, I had to take on recruiting of new members, carefully selecting students who would be a good fit for our programming and engineering needs. Once our team reached 5 programmers, I fully transformed our repository into a GitHub organization, with multiple repositories for each team member to experiment with hands-on. I also had to delegate specific tasks and manage deadlines to ensure that our software development stayed on track. For the FTC competition, I was also in charge of documenting our software iterations and innovations, which proved crucial in winning multiple awards for software design and innovation.
3. I am the Vice President (and former underclassmen president) of my school's Science Fair Club. As an officer, it is my role to fully lead and plan our club's biweekly lunch meetings. This involves brainstorming engaging activities with other officers, and preparing 35-40 minutes detailed presentations on various aspects of science fair projects. I have prepared extensive materials on project brainstorming, project methodology, data analysis, and trifold tips to help guide over 90 active club members. Additionally, I help students one-on-one through email or in-person (after meetings) to share my experience to help students make the right decisions. Finally, as a student who has been intimidated by the science fair process, I plan and cater my presentations to help lower the barrier to entry for new students and underclassmen, recruiting members by making science fair more approachable.
4. From halfway in my 9th grade to now, I have started, owned, and am fully maintaining a Discord study server for our school's student class of 2027. As the owner, I am fully responsible for a managing a team of 8 voted moderators, and I have to ensure that everybody's voices are heard. As the server is run through Discord, arguments and disagreements can easily escalate, so I have to step in as a neutral party to mediate and resolve conflicts. It was through these Discord "blow-ups" that I started learning how to be a better leader and work with others. I have poured over 300 hours into this server, managing over 100 active members. Housing over 50% of the class (at its peak) was a daunting task, and I had to deal with revolts and mass exodus of members multiple times. From arguments about the "wetness of water" to kicking me out of my own server, I have seen and managed all of these conflicts. Now, our server is a stable and thriving community, with valuable study resources, popular group study calls, and constant member engagement through general (and of-topic) text channels.

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 have been an active member of my community First Tech Challenge (FTC) Robotics team, serving as Co-Captain and Software Lead. I started in my freshman year from square one,

knowing no programming languages or concepts. Slowly, I picked up Java through the FTC SDK, and I eventually started writing functional code for our robot. As the season had progressed, I had become a decent programmer, and our team was able to win as a State Finalist alliance team and Area Innovate Award Winner for a unique fully-automated hang mechanism. In the following two years, I ramped up my time commitment and progressed my skills. By applying the Calculus knowledge I was learning in the classroom, I was able to implement a fully custom autonomous pathing system for our robot, using trigonometry, inverse kinematics, and PID control to achieve precise movement. In addition, I tinkered with computer vision, developing a custom TensorFlow model for failsafe object detection (with 100% match success). Our team went on to champion our league, become an Area Finalist captain, and place in the global top-30 for autonomous performance.

2. In my 9th grade, my independent research project for Science Fair qualified as a finalist project for the prestigious International Science and Engineering Fair (ISEF). My project started from a very simple idea of utilizing available thermal energy in a cooking pot to also stir the contents (to save energy for cooking). From here, I learned about the world of thermoelectric generators (TEGs) and the Seebeck effect. Applying the CAD and simulation concepts I learned from my Engineering class in school, I designed an aluminum enclosure that used a TEG, a heat sink, and a motor to convert heat energy into mechanical stirring. I also learned about electrical circuits as I used a voltage and current sensor to effectively graph my TEG's performance relative to the temperature differential. My final prototype, although simple, was able to win 1st in Engineering Technology at my regional science fair, where I also won a special awards through the US Metric Association and the US Air Force Certificate of Recognition. At ISEF, I was able to present to domain experts and professors from around the world, gaining valuable insights and feedback to later improve my prototype and project.
3. In my 10th grade, my research project for Science Fair won 3rd in Robotics and Intelligent Machines at the highly-competitive International Science and Engineering Fair (ISEF). After seeing many relatives of mine struggle with Parkinson's Disease, I wanted to help create a solution that could help them. Through research, I encountered an interesting method of using machine learning to aid in both walking and tremors. Using online published datasets, I applied a novel online signal processing approach that ensured real-time classification of gait patterns. After training multiple models and testing them through cross-validation, I ended up with a fully functional model with high accuracy and low inference times. However, I wanted to take this a step further and create a physical prototype. Using my engineering teacher's help, I designed a custom PCB with an ESP32 microcontroller and an IMU sensor, which I programmed to collect real time data to feed to my model. By using online resources and reading published literature methods, I was able to self-teach myself the needed Python and C++ to fully implement my working solution. My novel approach was recognized at the regional level, where I won 1st in Systems Software, TI Best Computing Project, and 2nd Grand Prize (qualifying me to ISEF). At ISEF, domain experts were equally impressed with my work, and I was awarded 3rd place in Robotics and Intelligent Machines, along with a $1200 award.
4. This year, I have started a passion project in maintaining a full-time server. After repurposing a decade-old budget laptop, I installed an Ubuntu Linux OS onto my machine and setup a home server. From here, I slowly the basics of bash scripting, networking, Linux, and service management through a hands-on approach. I set up multiple services, including a Matrix client used by my friends for communicating while in school. I also set up a Git server to host my code, which taught me a lot about permissions and how servers actually interact with clients. Most recently, I set up an SSH service which allows users to view a shell interactive I made to display my portfolio. While this extremely risky ,with over 1 million attacks in two months, I have learned a lot about security measured, and none of the attacks have been successful due to my proactive measures. While my server is mostly used for tinkering, I have learned a lot about networking and computing fundamentals through this project.
5. In my 9th Grade, I started taking on competition math to challenge myself, qualifying for the AIME (American Invitational Mathematics Examination) through AMC 10. After self-studying through online resources and textbooks, I learned the art of solving math problems in a intuitive, creative, and timely manner. Not only did I learn advanced math concepts, but I also learned the critical logical thinking and problem-solving skills needed to tackle complex problems. I have also competed and placed in local math competitions, including Purple Comet and Math League. As I encounter these problems through the online community Art of Problem Solving (AoPS), I have also started contributing solutions to problems. I learned how to clearly and concisely explain my thought process and solutions in LaTeX format, helping other students understand my unique approach to these complex problems. Within my high school, I also contribute challenging problems through our tutoring club, ACE, to help students in Geometry and

Calculus.

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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)

294 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.