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.
- **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.
- **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.
- **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.
- **National Honor Society (NHS) Member** (10th–11th Grade):
- **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 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 25+ active members. As founder, I recruited members through Instagram campaigns and word-of-mouth outreach. I organized and ran biweekly practice sessions, acting as both player and coach to guide new members through the sport's steep learning curve. Each practice required coordinating schedules across 25+ students, securing field space, managing equipment, and ensuring everyone stayed engaged. As a first-year club, I worked to bridge the skill gap between experienced cricketers and complete beginners, ensuring everyone was challenged while still having fun. I also organized matches with other local high school teams, coordinating with their club leaders, arranging transportation, and managing all match-day logistics.
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 codebase for our competition robot from scratch. When funding became a critical obstacle, I secured a $750 sponsorship from Texas Instruments through targeted outreach. As our team expanded, I recruited new members, strategically selecting students based on our programming and engineering needs. Once we grew to five programmers, I restructured our development workflow by creating a GitHub organization with multiple repositories for collaborative experimentation and version control. I delegated tasks and managed project deadlines to keep our software development on schedule. For competitions, I led documentation of our software iterations and technical innovations, which 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. As an officer, I lead biweekly lunch meetings for 90+ active members, collaborating with fellow officers to design engaging activities and delivering 35-40 minute presentations on critical aspects of science fair projects. I have developed comprehensive instructional materials covering project brainstorming, methodology, data analysis, and trifold design to guide students through the competition process. Beyond meetings, I provide one-on-one mentorship via email and in-person consultations, helping students navigate project decisions based on my own competition experience. Drawing from my initial intimidation with the science fair process, I specifically design presentations to lower the barrier to entry for new students and underclassmen, making a traditionally daunting competition more accessible.
4. From halfway through my 9th grade to now, I have founded, owned, and maintained a Discord study server for my school's class of 2027. As owner, I manage a team of eight elected moderators and facilitate democratic decision-making to ensure all members' voices are heard. Because disagreements can escalate quickly online, I regularly serve as a neutral mediator to de-escalate and resolve conflicts between members. I have dedicated over 300 hours to managing this server, which has supported 100+ active members and, at its peak, engaged over 50% of our class. I have navigated challenges ranging from minor disputes to major conflicts, including attempts to remove me as owner, requiring diplomacy and conflict resolution under pressure. Today, the server is a stable and thriving community offering curated study resources, regular group study calls, and consistent engagement through academic and social channels.
5. I serve as the Chemistry Officer (and former Math Officer) for my school's tutoring club, ACE. My primary role is to supervise student volunteers who create review materials for Chemistry, delegating units and topics to contributors and reviewing all posted resources to ensure accuracy and appropriateness. I also organize and monitor live tutoring sessions for AP Chemistry, both in-person and via Zoom, serving 20-30 students per session. My most demanding responsibility is stepping in to complete any unfinished materials or host sessions when other volunteers are unavailable, requiring me to maintain flexible availability to ensure a seamless experience for students seeking academic support.
6. I serve as the Technology Officer for my school's National Honor Society chapter. In addition to my technical duties, I moderate service events for 200+ student volunteers, managing both participant behavior and the execution of service activities to ensure productive community impact. I also represent our chapter at

leadership conferences such as LEAD, where I collaborate with officers from other NHS chapters to develop and share innovative leadership strategies.

7. In my freshman year, I served as an officer for my school's Math Club. As an officer, I presented approximately one-quarter of our weekly sessions to 15+ students, designing and delivering engaging lessons on mathematical applications and concepts such as mathematical card tricks and calculator programming. I was also responsible for maintaining detailed attendance records for each meeting to track participation 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 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)

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.