

## **Shri G.S. Institute of Technology & Science, Indore**

**Department of Computer Science and Engineering**



**Session : July-Dec 2023**

**B.Tech. 4<sup>th</sup> Year (7<sup>th</sup> Semester)**

### **INTERNSHIP REPORT**

**Submitted By:**

**SHUBHAM SHUKLA (0801CS201087)**

## **REPORT APPROVAL SHEET**

The **INTERNSHIP REPORT** submitted by **SHUBHAM SHUKLA (0801CS201087)** is approved as partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** degree by **Shri Govindram Seksaria Institute of Technology and Science Indore M.P.**

**Endorsed By :**

**Head, Department Computer Science and Engineering SGSITS Indore M.P.**

## ABSTRACT

Our internship project revolves around the development of an Automated Microscope System that can accurately focus on 10-micron particles. This initiative is a collaborative effort of a four-member team, working towards innovative solutions in the field of microscopy. We leverage a mix of technologies to bring this project to life. Tkinter is used for creating a user-friendly desktop UI in Python. Python forms the backbone for the logic and control mechanisms behind the application, ensuring precise and reliable results. To interface with the hardware, C++ is employed to write code for the Arduino, enabling the control of the microscope stage and probe. This internship offers an attractive stipend of 8000 rupees per month to each team member, providing a valuable learning experience while being financially rewarding. During the course of this internship, we faced several significant challenges. One major hurdle was the intricate assembly of hardware components. Achieving seamless synchronization between the Python code and serial inputs sent to the Arduino for motor control was a formidable task. Our project reaches new heights by implementing machine learning models to achieve near real-time particle tracking. The system's precision and automation make it invaluable for a range of applications, from scientific research to industrial quality control. With the successful completion of this project, our team aims to explore further applications in the field of automated microscopy. This internship project not only hones technical skills but also fosters an interdisciplinary approach, combining programming, electronics, and image analysis. The system's ability to focus on minute particles has the potential to advance scientific research by enabling more efficient and accurate microscopy. The Tkinter-based user interface makes the system accessible to a wide range of users, including those with minimal technical expertise.

## **ACKNOWLEDGEMENT**

We would like to take this opportunity to express our gratitude to Mr. Alok Gupta Sir and all those people who have helped us in our project, for their valuable guidance and experience which they poured on us in right direction. Their persistent encouragement, everlasting experience and valuable inspiration helped us a lot in molding the present shape of the project.

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## COMPANY INFORMATION

|                         |   |
|-------------------------|---|
| <b>Company</b>          | <b>SEGS India</b>   |
| <b>Website</b>          | <a href="https://sgsitsincubationforum.com/incubates/segs-india">https://sgsitsincubationforum.com/incubates/segs-india</a> |
| <b>Address</b>          | ATC Building 4th floor , 23 Park Road Sir M. Visvesvaraya Marg, Indore,<br>Madhya Pradesh 452003                            |
| <b>Title</b>            | <b>R&amp;D Intern</b>   |
| <b>Mode</b>             | Offline   |
| <b>Stipend Received</b> | Yes (8000/month)  |
| <b>Duration</b>         | 2 months  |
| <b>Time : From - To</b> | 05 June 2023 to 05 August 2023  |
| <b>Mentor</b>           | Mr. Alok Gupta (Mob. +91 7747845136)  |

**Company Name :** SEGS India

### **About Company :**

**SEGS India is the startup started with orientation that industries and academic work together to give more industrial exposure to upcoming engineers .Establish with an aim to target industrial automation, test measuring instrument and research project for customized applications apart from that the industrial training in the same domain will be provided to the willing interns.**

**Alok Gupta is founder of SEGS India having more than two decades of experience in academics and Industry worked in the domain of research and development for past 17 years to develop training products for education and in industrial automation for the various industries.The other partner is Dr.Mrs Adil who is academician and working as professor dealing in core research area for more than two decades in same.**

## **INTERNSHIP SUMMARY**

- 1. Project Objective:** Development of a Precision Automated Microscope System for 10-micron particle focusing.
- 2. Collaborative Team:** A four-member interdisciplinary team leading innovation in microscopy.
- 3. Technology Mix:** Utilizing Tkinter for Python-based user-friendly UI, Python for logic, and C++ for Arduino control.
- 4. Financial Incentive:** Interns receive a monthly stipend of 8000 rupees, enhancing the learning experience.
- 5. Technical Challenges:** Overcoming hardware assembly intricacies and ensuring Python-Arduino synchronization.
- 6. Machine Learning Integration:** Implementation of machine learning models for real-time particle tracking.
- 7. Versatile Application:** Ideal for scientific research and industrial quality control applications.
- 8. Future Exploration:** The team is eager to explore additional automated microscopy applications.
- 9. Interdisciplinary Learning:** Fostering skills in programming, electronics, and image analysis.
- 10. Scientific Advancement:** The system's precision empowers more efficient and accurate microscopy, benefiting scientific research and users with diverse technical backgrounds.

## INTERNSHIP DETAILED REPORT :

| MONTH     | WEEK   | TASK  |
|-----------|--------|---|
| JUNE 2023 | WEEK 1 | Initiated our engagement with a comprehensive introduction to the company, providing insights into our technological stack, and offering a glimpse into the array of projects we are currently involved in. |
|           | WEEK 2 | Conducted an in-depth exploration of ongoing projects and delved into the pressing challenges faced across various engineering domains.   |
|           | WEEK 3 | Introduced the concept of an Automated Microscope empowered by Artificial Intelligence to our decision-making committee, securing their enthusiastic approval.  |
|           | WEEK 4 | Commenced our hardware development efforts and compiled a meticulous list of component requisites.  |
| JULY 2023 | WEEK 5 | Successfully procured all essential components, including the microscope, stage, and motors. These components were expertly configured and seamlessly integrated into a unified hardware system.            |
|           | WEEK 6 | Devised an Auto-focusing algorithm, thoughtfully coded in both Python and C++ to harmonize with our Arduino platform.   |

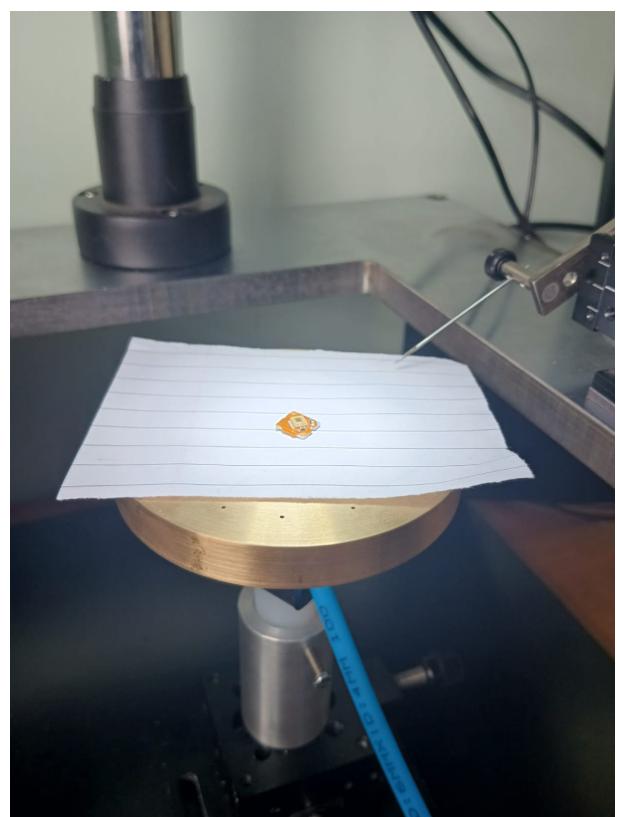
|  |               |   |
|--|---------------|---|
|  | <b>WEEK 7</b> | Developed a cutting-edge YOLO v8-based circle tracking model, enhancing our real-time circle tracking capabilities, particularly valuable for the imprinted markers on the stage. |
|  | <b>WEEK 8</b> | Crafted an intuitive and user-friendly desktop application interface through the utilization of tkinter, ensuring a seamless user experience.                                     |

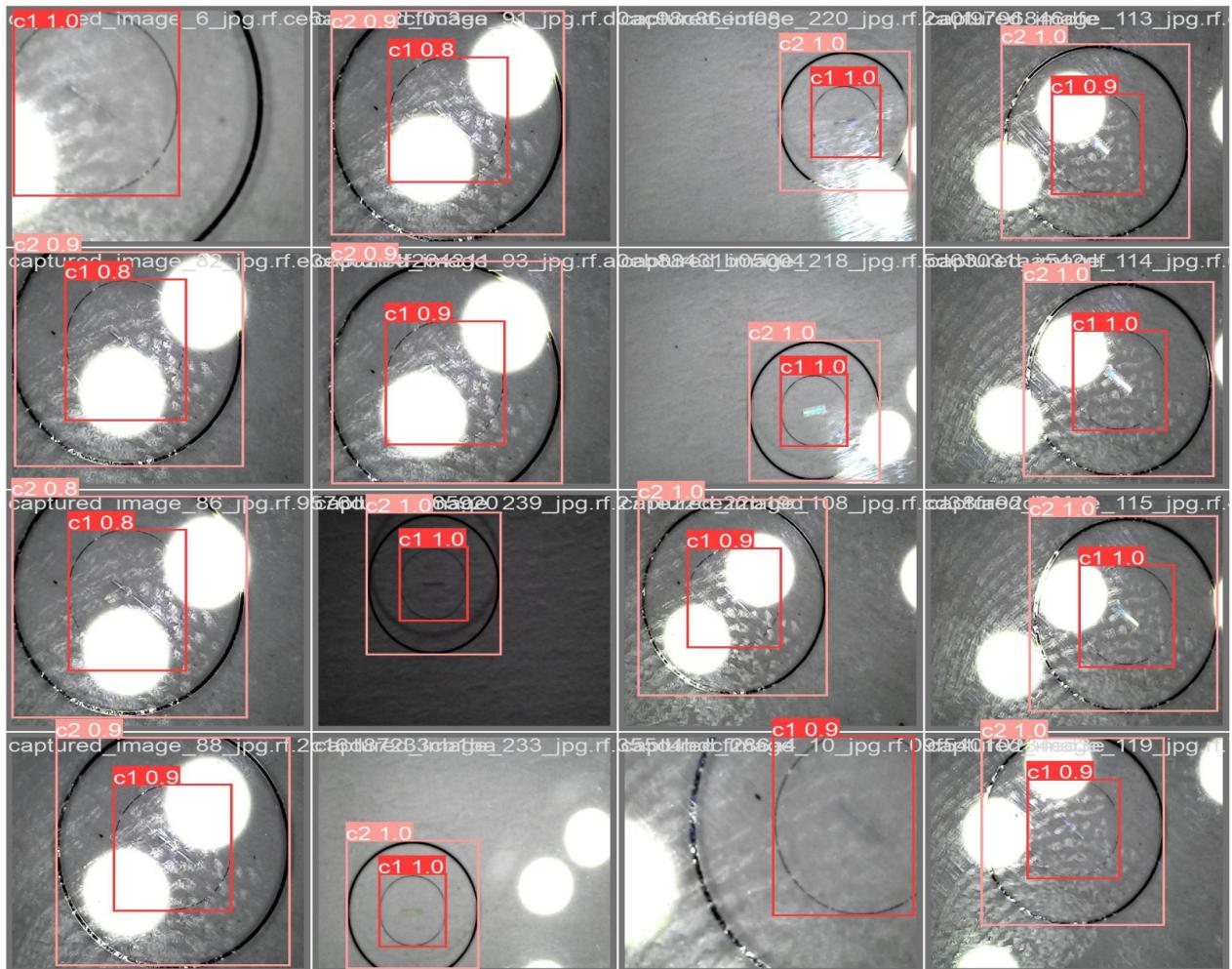
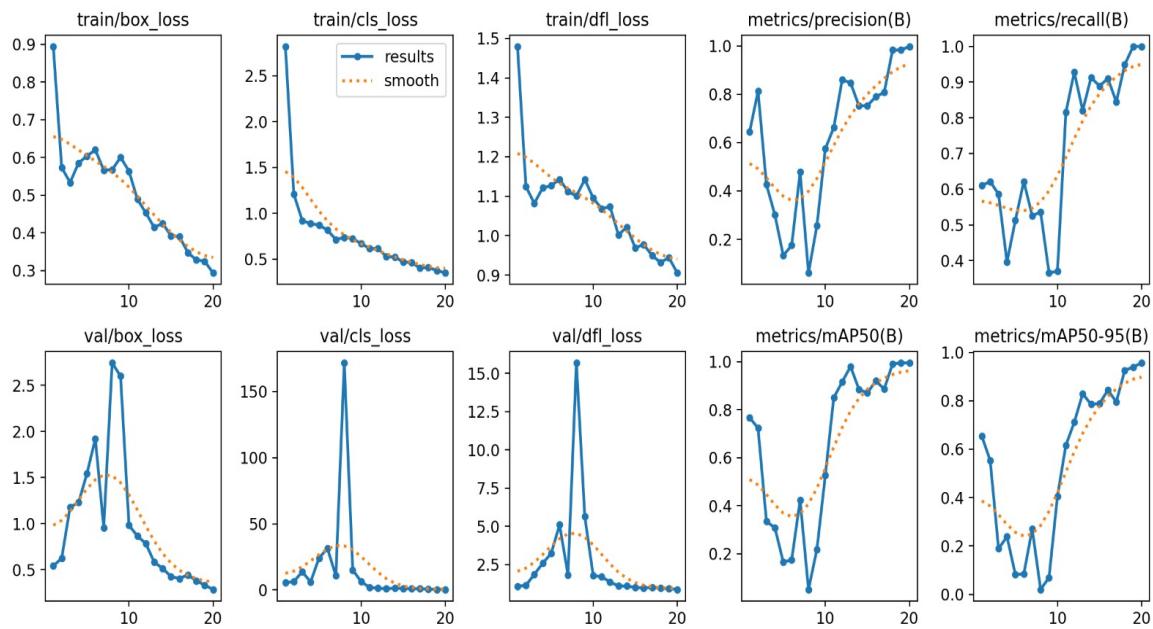
### **Technologies Used**

- **PYTHON**
- **C++**
- **TKINTER**
- **YOLO V8**

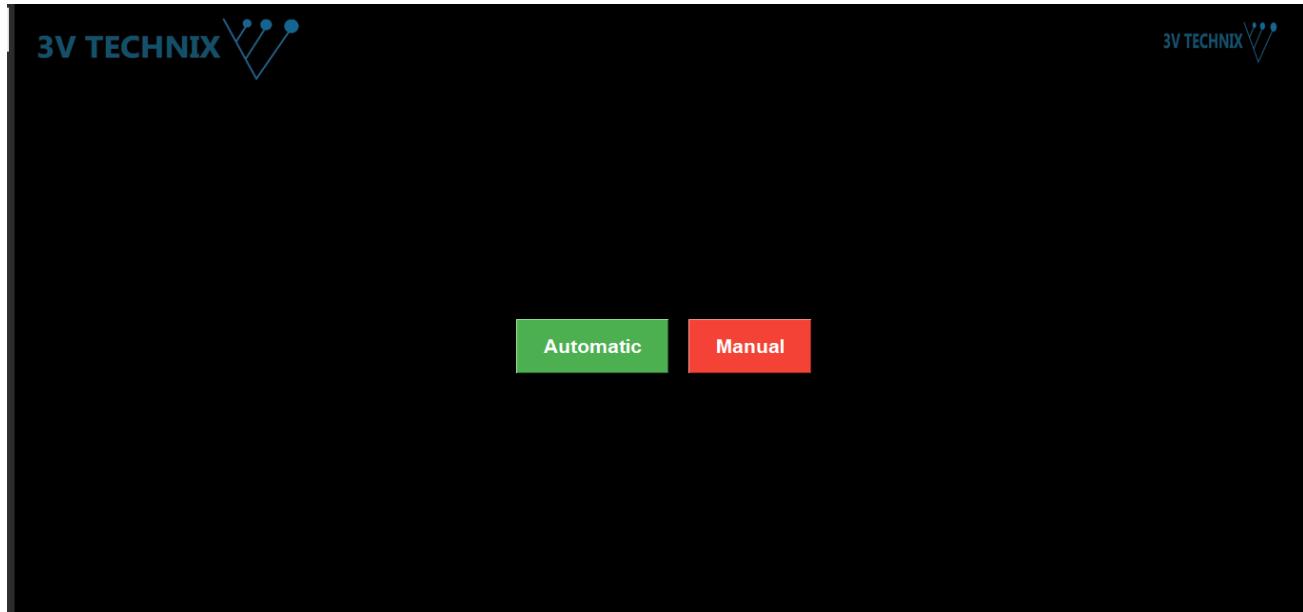
## Learning Outcomes

- 1. Team Collaboration:** Working in a four-member team offered valuable experience in collaboration, communication, and problem-solving.
- 2. Microscopy Expertise:** Interns gained deep insights into microscopy technology, including precision focusing on 10-micron particles.
- 3. Technology Stack:** Exposure to a diverse technology stack, encompassing Tkinter, Python, C++, and machine learning, broadened their technical skill set.
- 4. Coding Proficiency:** Developing logic and control mechanisms in Python and C++ enhanced coding proficiency and real-world application.
- 5. User-Centric Design:** Creating a user-friendly desktop UI (Tkinter) emphasized the importance of user experience and interface design.
- 6. Interdisciplinary Approach:** The project fostered interdisciplinary learning, combining programming, electronics, and image analysis to address scientific and industrial challenges.
- 7. Scientific Advancement:** The project's potential to enhance scientific research underlines the significance of their work.
- 8. Professional Growth:** The ability to convey complex technical information to non-technical users was a professional growth aspect.
- 9. Versatile Application:** Learning how technology can serve applications ranging from scientific research to industrial quality control.
- 10. Quality Assurance:** Understanding the importance of precision and accuracy in microscopy for quality assurance and scientific accuracy.
- 11. Problem-Solving:** Tackling and surmounting challenges during the internship reinforced problem-solving and critical thinking skills.



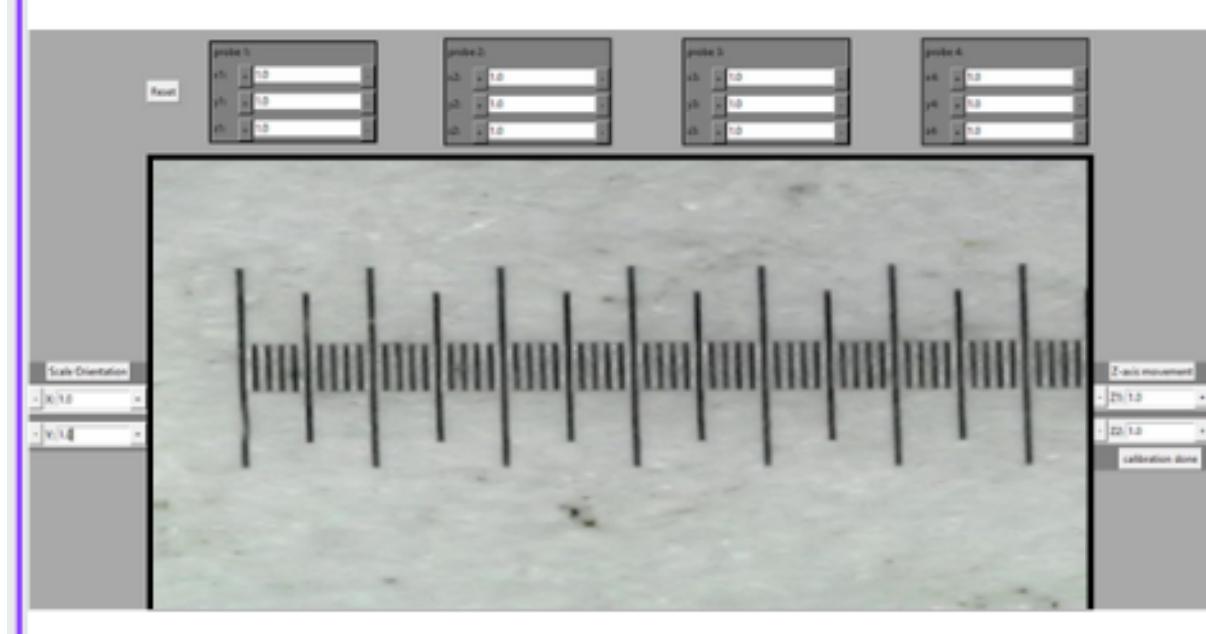


# UI Images

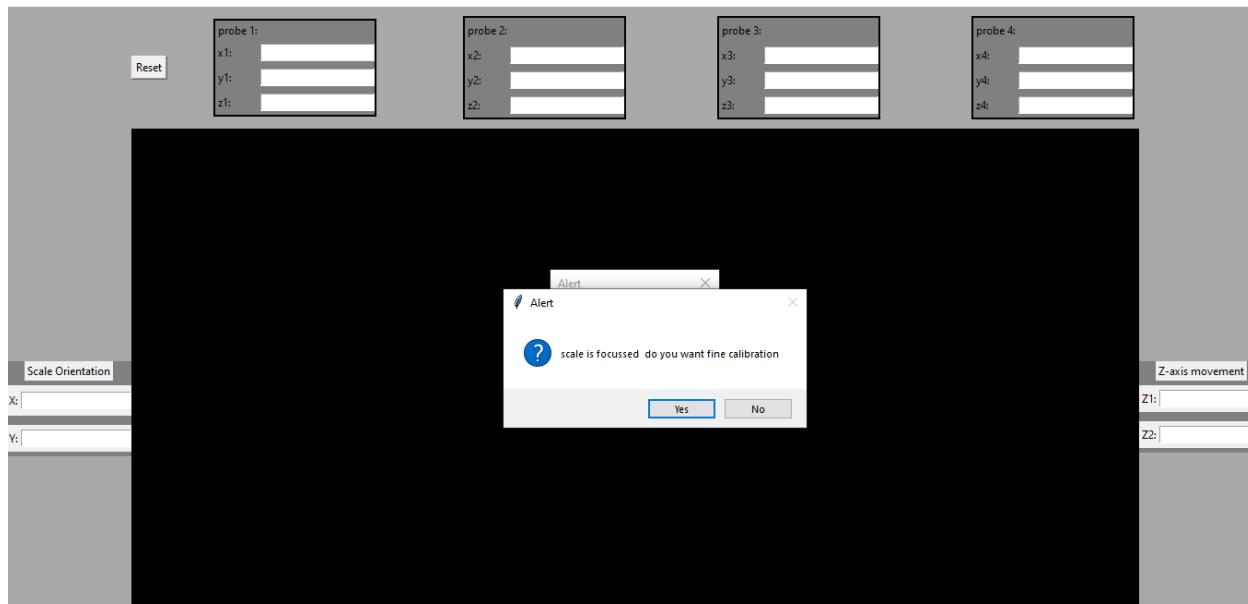


Select Configuration

Autofocus Mode on



Focus Mode



Explore Manual Mode

## COMPONENTS USED

| Sr. No. | Name of component | Specification       | Quantity | Cost per piece<br>(in Rs) |
|---------|-------------------|---------------------|----------|---------------------------|
| 1       | Arduino Mega      | ATMega 2560         | 1        | 1650/-                    |
| 2       | Stepper Motor     | 28BYJ-48            | 4        | 150/-                     |
| 3       | Driver            | ULN2003A            | 4        | 53/-                      |
| 4       | Scale Slide       | 10 micron imprinted | 1        | 500/-                     |
| 5       | X,Y,Z - Stages    | High precision      | 1        | 18000/-                   |

|    |                        |  |         |        |
|----|------------------------|--|---------|--------|
| 6  | USB Digital Microscope | 5MP ,<br>50X to 1600X ,<br>20 FPS camera | 1       | 1850/- |
| 7  | Pulley & Belt          |  | 3       | 150/-  |
| 8  | Acrylic Sheets         | 5mm thick                                | 3       | 720/-  |
| 9  | Jumper wires Packets   |  | 3 pairs | 60/-   |
| 10 | Arduino Cable          | USB 2.0                                  | 1       | 190/-  |
| 11 | 5V Adapter             |  | 1       | 220/-  |