

## Antibiotics resistance analyzer

Project Information	<p>This project involves the development of an automated antibiotic susceptibility testing (AST) tool using image analysis and classification. The product enhances the customer experience by simplifying the AST process: users capture an image of a petri dish with antibiotic disks, and the system automatically detects inhibition zones, measures them in millimeters, and interprets them against established susceptibility breakpoints. This eliminates manual measurement and lookup, reduces human error, and improves speed and accuracy in microbiological testing workflows.</p>
Objectives/Goals	<ul style="list-style-type: none"><li>• Automate the measurement of antibiotic inhibition zones from petri dish images.</li><li>• Provide accurate classification of susceptibility: Susceptible, Intermediate, or Resistant.</li><li>• Ensure compatibility with standardized breakpoint data (e.g., CLSI or EUCAST).</li><li>• Deliver easy-to-use interface for entering antibiotic names and viewing results.</li><li>• Achieve measurement accuracy within +/- 1 mm.</li><li>• Reduce analysis time by at least 70% compared to manual methods.</li></ul>
Assumptions & Constraints	<p><b>Assumptions:</b></p> <ul style="list-style-type: none"><li>• Users have access to a camera or scanner to capture images of petri dishes.</li><li>• Images have sufficient resolution and contrast to detect inhibition zones.</li><li>• Users can provide antibiotic names manually in the correct order.</li></ul> <p><b>Constraints:</b></p> <ul style="list-style-type: none"><li>• Must not rely on continuous internet access.</li></ul>

	<ul style="list-style-type: none"> <li>• Should run in constrained environments like Google Colab or local systems.</li> <li>• Limited to disk detection on circular petri dishes with standard disk placement.</li> </ul>
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Background & Strategic Fit	<p>Manual zone measurement in AST is time-consuming, error-prone, and subject to interpretation differences. By automating this process with computer vision and classification, this product supports microbiologists, lab technicians, and educators by providing a rapid and standardised method. The organisation has experience in machine vision and software development, making it well-equipped to implement a reliable, user-friendly solution that aligns with broader efforts to digitise laboratory workflow</p>
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Scope: User Stories & Requirements	<ul style="list-style-type: none"> <li>• <i>As a lab technician</i>, I want to upload an image of a petri dish and get zone measurements automatically.</li> <li>• <i>As a student</i>, I want to type in antibiotic names and receive susceptibility classifications.</li> <li>• <i>As a researcher</i>, I want to export zone diameters for record-keeping and analysis.</li> </ul> <p><b>Requirements:</b></p> <ul style="list-style-type: none"> <li>• Detect disks in an image using thresholding and distance filtering.</li> <li>• Measure inhibition zone diameters in pixels and convert to millimeters.</li> <li>• Allow manual antibiotic name entry and match against known breakpoints.</li> <li>• Output classification and results in readable format.</li> </ul>
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Product Features	<ul style="list-style-type: none"> <li>• Disk detection <ul style="list-style-type: none"> <li>- <i>Find and validate disk locations</i></li> <li>- <i>Enable zone measurement</i></li> </ul> </li> </ul>
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	<ul style="list-style-type: none"> <li>- <i>Analyze petri dish image</i></li> <li>● Diameter Calculation <ul style="list-style-type: none"> <li>- <i>Measure pixel width and convert to mm</i></li> <li>- <i>Provide precise zone size</i></li> <li>- <i>Calculate susceptibility</i></li> </ul> </li> <li>● Antibiotic Entry <ul style="list-style-type: none"> <li>- <i>Manual input of antibiotic names</i></li> <li>- <i>Map zones to antibiotics</i></li> <li>- <i>Classify results</i></li> </ul> </li> <li>● Classification <ul style="list-style-type: none"> <li>- <i>Interpret results based on breakpoints</i></li> <li>- <i>Show susceptibility</i></li> </ul> </li> <li>● File Output <ul style="list-style-type: none"> <li>- <i>Save results to zones.txt</i></li> <li>- <i>Enable data storage and reuse</i></li> <li>- <i>Document test results</i></li> </ul> </li> </ul>
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Release Criteria	<ul style="list-style-type: none"> <li>● <b>Functionality:</b> Detect and classify zones with high accuracy.</li> <li>● <b>Usability:</b> Accept standard image inputs and antibiotic name inputs.</li> <li>● <b>Reliability:</b> Handle various lighting and disk positions with stability.</li> <li>● <b>Performance:</b> Process and return results in &lt;10 seconds per image.</li> <li>● <b>Supportability:</b> Work offline and in cloud notebooks like Google Colab.</li> </ul>
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Success Metrics	Time to result reduced to under 10 seconds
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## Exclusions

- Automatic antibiotic name recognition from disk labels.
- Support for multi-layered or non-standard petri dish layouts.
- Real-time video analysis.