How might we...
Prevent drug resistance by diagnosing malaria severity in the field with a low cost and minimal human intervention.

The Cost of Malaria

<table>
<thead>
<tr>
<th>Objective 1</th>
<th>3.4 Billion at Risk</th>
<th>460,000 Deaths</th>
<th>460,000 Deaths</th>
</tr>
</thead>
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**Develop Algorithm in MATLAB.** MATLAB is ideally suited to this project because it ships with many Computer Vision and Machine Learning algorithms, so trying new techniques is easy.

**Measures of Success:** Algorithm accurately pinpoints malarial parasites on small sets of data (~10 slides)

**Objective 2**
Develop a prototype for the device’s hardware. The design should be human oriented and be reliable enough to withstand adverse environmental conditions.

**Measures of Success:** Device will mechanically translate the slide on its own with a backup, hand operated system

**Objective 3**
Verify accuracy of Software/Hardware combination, ensuring that the results have greater than 90% sensitivity and specificity, as well as a correlation between observed and actual densities of at least 0.9.

**Measures of Success:** Hardware and software run concurrently to return >90% sensitivity

**Actions Taken**
- Developed software for annotation and classification of parasites from microscope views.
- Generated a design specification for the hardware.

**Data & Results**
Example of malaria classification, where Red areas indicate regions where the algorithm thinks malaria is present.

**Future Direction**
- Finish prototyping hardware.
- Verify accuracy of entire system.
- Test for reliability in adverse conditions.
- Explore options for bringing the device to market.

Our Solution

- **Digital images acquired with microscope.**
- **Feature Descriptors computed for each 64x64 pixel region.**
- **Feature descriptors are used to classify each region as either one species or something else with a pre-trained Support Vector Machine (SVM).**
- **Region-by-region classifications are used to find infected individual red blood cells. This information is used to compute the density by finding the percentage of RBCs that are infected. The resulting information is displayed to the physician to make an informed decision.**

-Blessing Gbandan
Ghanaian Field Representative for Saha Global

460,000 Deaths
3.4 Billion at Risk
460,000 Deaths

"Because anybody can walk to any pharmacy anytime, any day and buy the medicine of their choice they usually buy commonly advertised malaria medicine which can be [overused]. [...] I think having a more specific means of diagnosis available will encourage people to stop this.”

Daniel Cohen | Gregory Cooke | Phoebe Edalatpour | Gabrielle Lupacchino | Kunal Mehan | Theodore Virtue