MLE Student Capstone Proposal

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| Project Title | Automatic crop disease detection, diagnosis and remedial actions description. |
| Industry Sponsor | TBD |

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## 

## AI Product/Capstone Project Description

### Problem

[Write a succinct statement of the problem that you're trying to solve (<50 words)]

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| Crop producers must identify on-site if a particular crop is affected by a disease, a pest, or inadequate soil preparation. Experts are not always available, and crop yields will be compromised if timely action (use of pesticides, herbicides, irrigation, or fertilizer adjustments) is not done immediately. |

### Why

Write about why this is a problem worth solving. What is the business value hypothesis that connects to what success looks like and for whom? (~50-250 words)

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| Crops’ yields can diminish if the appropriate corrective measures are not immediately taken. A fast and automatic diagnostic tool, which also outputs clear instructions on how to contain or remedy the situation, can prevent the loss of significant amounts of money to the producers.  A successful deployment includes a functional product that allows a field operator to use a picture from a remote tractor camera or cell phone to produce a specific written assessment of the situation and a detailed description of the measures to contain or remedy the situation. |

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### Success

Write about what success looks like. What is the Key Performance Indicator (or couple of KPIs)? How might they connect to a relevant ML model accuracy metric? (<50 words)

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| The ML project includes a computer vision model to identify the particular plant sample and detect an abnormal growth situation, and an NLP model to provide a precise diagnosis with a written set of actions to help remediate or contain the problem.  Image classification KPI will apply to species and disease classification. Readability and answer relevance KPIs will apply to the NLP model output. |

### Audience

Specify exactly which users/customers this AI/ML product is being built for. What is the customer's pain or need that connects back to the problem? (<50 words)

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| This application can benefit both large and small agriculture producers.  Large companies can rely on it to detect a problem faster by untrained operators and get response teams and experts on the move right away.  Smaller producers need an on-the-spot diagnostic of how well or poorly the crop cycle is going. They need a precise diagnosis of any present problems and a simple step-by-step description of how to contain or solve a problem until they can call for expert help. |

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### What

Now describe what the ML looks like. This includes a discussion of data and sources, potential/likely models, a choice of an accuracy metric to optimize for and a defense of your choice. How does your accuracy metric connect back to the KPI(s) named above?

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| Data:  Annotated datasets from agricultural databases for the detection of traditional crop diseases. TBD  Smaller sample datasets with local variants to perform semi-supervised learning on trained models. TBD  Agricultural knowledge databases to generate relevant queries based on diagnostics. TBD  Model:  Python, Pandas, Keras or TensorFlow or PyTorch, Scikit-learn, Hugging Face Transformers (T5, and others).  Use of pretrained models, transfer learning.  Should be a deployable version for remote use in the field (assumes connection to internet).  The goal will be to chieve accuracy metrics comparable to those of agricultural field engineers and readable diagnosis and next steps. Goal is to prevent major damage to crop yields while obtaining expert help.  I am not (yet) proficient enough to give a definitive description of the MLE for the project at this time. |

You may also find it helpful to fill out an [MLOps Stack Canvas](https://ml-ops.org/content/mlops-stack-canvas) or [MLOps Stack Template](https://ml-ops.org/content/state-of-mlops). These tools really help to clarify tech stack requirements for our students.

### Final Deliverables

At the conclusion of a cohort, students are expected to deliver:

* Deployed Demo
* 10-minute Presentation
* GitHub Repo ( description in README + code )

For more detailed information on student capstone projects, you can check out the guide that we provide MLE students [here](https://docs.google.com/document/d/1lFRKgc9darivZaNaGoGni9Gch3hIuwnkN8AVql-kreU/edit?usp=sharing).

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### Anything Else?

Please provide any additional information on key activities, technologies, datasets, expected learning outcomes, potential mentorship or employment opportunities, or anything else not listed above!. And thanks for supporting our students!

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| Initial training will be dome with best available curated crop disease datasets. Continuous testing must include new data from local samples to include and diagnose local variants and not well described crop diseases. Or the ability to use new training data from other public sources/ crop producers, if available.  The availability of a curated crop disease treatment database is expected but it may need to be created from several different sources.  The model should also include the detection of crops suffering from improper soil preparation, irrigation and use of fertilizers, which is an integral part of a good crop production. |

**About FourthBrain**

FourthBrain trains aspiring Machine Learning engineers in the technical and practical skills necessary to contribute immediately to an AI team. Our remote, online program is designed to be flexible and accessible for anyone with software experience. We infuse values of collaboration, communication, empathy, and equity throughout the program.

We are part of the AI Fund, founded by Andrew Ng.