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Project Proposal - Plant Disease Detector ML App

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1. Brief Overview

The "Plant Disease Detector ML Web App" is here to help farmers, gardeners, and anyone with a green thumb figure out what's messing with their plants, no hassle involved. Checking plants for diseases the old-school way sucks—it's slow, costs a chunk of change, and unless you're some plant whisperer, you're probably guessing half the time. This web app fixes that. You just upload a pic from your phone or laptop, and boom, it tells you what's wrong and how to fix it. It's built for regular folks—whether you're growing acres of crops or just trying to keep your basil alive. The whole point is to catch those nasty diseases early so you don't lose half your harvest, and it's all right there in your browser, no fancy gear needed.

Here's the deal: we're making a web app that's dead simple to use, powered by some brainy machine learning stuff—like a convolutional neural network, but you don't need to care about the nerdy details. We'll feed it a ton of pics of healthy and messed-up plants, kicking things off with big hitters like tomatoes and potatoes since they're everywhere. It'll analyze your upload, spit out a diagnosis, and throw in some real-world advice—like "spray this" or "cut that part off." This isn't just tech for tech's sake; it's about giving people a legit tool to save their plants without needing a botany degree. We'll start with a few crops and build it out later, but right now, it's about getting this thing live on the web so anyone with Wi-Fi can jump in and use it.

2. Introduction

2.1. Background

Plant health is the beating heart of agriculture—without it, we'd be up a creek with no paddle. Healthy plants mean bumper crops, full bellies, and a steady flow of cash for farmers who pour their lives into the soil. It's not just about feeding people today; it's about making sure we've got enough tomorrow, too, especially with the world's population climbing and climate throwing curveballs.

When plants are firing on all cylinders, they're not just growing food—they're keeping rural communities alive, stabilizing economies, and even helping fight off hunger on a global scale. But when disease hits, it's a gut punch: yields drop, money dries up, and what could've been a good season turns into a scramble to survive. Bottom line? Keeping plants healthy isn't some side gig—it's the foundation everything else stands on.

2.2. Problem Statement

Detecting plant diseases is a nightmare for anyone trying to keep a farm or garden alive. The old-school way—walking around, eyeballing every leaf, and hoping you spot something off—feels like searching for a needle in a haystack with your hands tied. It's not just that it takes forever; it's that most people don't even know what they're looking for. Unless you've got years of experience or a fancy degree, telling the difference between a random wilt and a full-on fungal invasion is a crapshoot. And even if you do catch it, good luck figuring out what to do before it spreads. The whole process is a slog, chewing up time that farmers don't have, especially when they're already juggling a million other things to keep their operation running.

Then there's the expertise problem, which makes it even worse. Calling in a pro sounds great until you realize they're not exactly hanging out on speed dial—and when they do show up, their bill can hit harder than the disease itself. For small farmers or backyard growers, that's not even an option; they're stuck relying on guesswork or outdated advice from the neighbor. Plus, by the time anyone—expert or not—gets a handle on what's wrong, the damage is often done, and half the crop's toast. Manual inspections just can't keep pace with how fast diseases move or how

much ground needs covering. It's a losing battle, and it's leaving too many people scrambling to save what's left instead of stopping the problem before it starts.

2.3. Proposed Solution

The fix for this mess is a machine learning-based web app that takes the headache out of spotting plant diseases. Instead of trudging through fields or shelling out for an expert, you just snap a pic of your plant, upload it from wherever, phone, laptop, whatever, and let the app do the dirty work.

Behind the scenes, it's powered by some smart tech that's been trained on a boatload of plant pics, so it can figure out what's wrong faster than you can say "blight."

It doesn't just stop at naming the disease either; it'll toss you some straightforward advice on how to handle it, like what to spray or when to yank the plant.

The beauty of it being a web app is you don't need anything fancy, just a browser and a decent internet connection, and suddenly, you've got a tool that's quick, accurate, and doesn't care if you're a farmer with 100 acres or a guy with a tomato pot on the porch. It's about putting the power back in people's hands, no expertise required.

3. Objectives

3.1. Primary Goal

The heart of this project is simple: build a machine learning web app that nails down plant diseases with pinpoint accuracy. We're talking about a tool that doesn't just guess—it knows what's up, whether it's a sneaky fungus or some nasty bacterial rot, and gets it right every time you upload a pic.

The goal isn't to make something flashy for the sake of tech cred; it's to create a reliable sidekick for anyone who's ever stared at a drooping plant and thought, "What the hell's wrong with you?" By harnessing machine learning, we're aiming to cut through the confusion and deliver clear, dead-on diagnoses that people can trust, whether they're feeding a family from a backyard plot or managing a sprawling farm.

Accuracy is the name of the game here, because a wrong call doesn't just waste time; it risks losing crops, cash, and a whole lot of hard work.

3.2. Specific Objectives

To make this Plant Disease Detector ML Web App a reality, we've got a few key targets to hit. First up, we're training a machine learning model on a solid stack of plant disease datasets—think thousands of pics showing everything from healthy leaves to ones riddled with spots or rot. The idea is to teach it the difference between "all good" and "oh crap," so when you throw a photo its way, it's ready to call it like it sees it.

Next, we're setting it up for real-time detection, where you can upload a snapshot straight from your phone, laptop, or whatever's handy, and get an answer without twiddling your thumbs—fast enough to act before the problem spreads.

Finally, we're making sure it's not just smart but easy to use, spitting out a clear diagnosis and practical next steps, like "spray this" or "cut that," in plain language anyone can follow. No jargon, no fuss—just a tool that works for real people with real plants.

4. Scope

4.1. Target Users

This Plant Disease Detector ML Web App is built with a few key folks in mind, starting with farmers who are out there feeding the world one harvest at a time. Whether they're running big operations with rows of crops stretching to the horizon or smaller setups just trying to make ends meet, these are the people who need a quick, reliable way to spot trouble before it tanks their season.

They don't have time to mess around with complicated tools or wait for some lab report, when disease hits, they need answers yesterday, and this app's designed to deliver exactly that. It's for the guy who's up at dawn checking his soybeans or the woman keeping her family farm afloat, giving them a shot at catching problems early without needing a botany degree or a fat budget.

Then there's gardeners, the backyard warriors and plant lovers who might not be growing for profit but still care like crazy about their greenery. We're talking about the person with a veggie patch out back, the urban grower with pots on a balcony, or the hobbyist nursing roses like they're family. For them, losing a plant to disease isn't just a bummer, it's personal, and they don't always have the know-how to figure out what's wrong. This app's got their back, making it easy to upload a pic and get a fix without wading through dense manuals or pricey consultants.

And finally, we're roping in agricultural experts, think extension agents, researchers, or crop advisors, who already know their stuff but could use a fast, sharp tool to back up their calls in the field. They might spot the signs themselves, but this app can double-check their hunches or handle the grunt work when they're stretched thin. It's all about serving up practical help to anyone with dirt under their nails, no matter their scale or skill.

4.2. Features

The Plant Disease Detector ML Web App comes loaded with a trio of features that make it a game-changer for anyone dealing with sickly plants. First up is image-based detection, the bread and butter of this whole thing. You snap a photo—could be

with your phone, a camera, whatever, and upload it right to the app through your browser. No need to fuss with special gear or complicated steps; it's as easy as posting a pic online. The app's machine learning engine takes that image and digs into it, scanning for the telltale signs of trouble like spots, wilting, or weird colors, so you don't have to play detective with a magnifying glass. It's built to handle real-world shots, messy leaves, bad lighting, and all, and still get the job done fast.

Then there's disease classification, where the app doesn't just say, "Yep, something's wrong" and leave you hanging—it names the culprit. Whether it's blight chewing through your tomatoes or powdery mildew choking your squash, this thing's trained to pin it down with precision, pulling from a deep well of plant disease know-how. You'll get a clear callout, like "this is late blight" or "that's root rot," so you're not left scratching your head wondering what's killing your crop. And finally, it's got remedy suggestions to seal the deal.

Once it IDs the problem, it doesn't stop at bad news; it hands you a plan, like "spray with this fungicide," "cut off the infected bits," or "water less and pray." These aren't vague, textbook tips; they're practical moves you can actually make, tailored to whatever's plaguing your plants. Together, these features turn a quick upload into a full-on rescue mission, keeping it simple and useful from start to finish.

4.3. Limitations

Plant Disease Detector ML Web App isn't going to solve every plant problem under the sun right out of the gate. For starters, we're zeroing in on a handful of specific diseases to kick things off. Think big hitters like late blight on tomatoes, powdery mildew on cucumbers, or maybe rust on wheat—stuff that's common enough to matter but manageable enough for us to nail down with solid accuracy. We're not trying to tackle every obscure leaf-rotting fungus or rare viral nightmare just yet; that's a beast for later.

By focusing tight at first, we can make sure the app's damn good at what it does instead of half-assing a million things and leaving you with shaky results. It's about building a strong base we can grow from, not pretending we've got it all figured out day one.

On top of that, there's some geographic relevance to wrestle with. Plants don't get sick the same way everywhere.

5. Methodology

5.1. Data Collection

To get this Plant Disease Detector ML Web App off the ground, we need a mountain of plant disease images to teach it what's what—and we're not skimping on the sources. First stop is open datasets, the goldmines of the research world. Stuff like PlantVillage, with its tens of thousands of pics showing everything from healthy leaves to ones hit by blight, mildew, or rot, is a no-brainer—it's free, it's vetted, and it's packed with variety. We'll dig into other public troves too, like university archives or agricultural databases, pulling shots of diseased tomatoes, potatoes, or whatever crops we're targeting first. These datasets are clutch because they're already labeled by pros, so we're not starting from scratch guessing if that yellow spot's a problem or just bad lighting. It's like getting a head start with a cheat sheet.

But we're not stopping there, open datasets won't cover every angle, so we're also looking at a custom collection to fill the gaps. That means rounding up our own photos, maybe from local farmers, gardeners, or even a few field trips with a camera if we can swing it.

5.2. Model Selection

Picking the right machine learning model for this Plant Disease Detector ML Web App is like choosing the perfect tool for a job, you want something sharp, reliable, and not overkill. We're leaning hard into convolutional neural networks (CNNs) because they're the champs at making sense of images, and that's exactly what we need when we're staring down a pile of plant pics.

Think of CNNs as a brain that's wired to spot patterns—like the way a leaf's edges curl with blight or the speckles of rust popping up. We're eyeing models like ResNet, which is deep and clever enough to catch the tricky stuff without getting bogged down, or MobileNet, which keeps things light and fast so the app doesn't choke on slower connections.

These aren't random picks; they've got a track record in projects like this, balancing accuracy with the kind of speed we need for a web app anyone can use.

5.3. App Development

Building the Plant Disease Detector ML Web App is where the rubber meets the road, and we're rolling with Streamlit to make it happen. Streamlit's our pick because it's a no-nonsense way to whip up a web app that's slick, interactive, and doesn't need a whole army of coders to pull off.

We're talking about a setup where you can upload your plant pic, hit a button, and watch the magic unfold, all in your browser, no downloads or tech headaches required.

It's Python-based, which plays nice with our machine learning models, and it's fast to tweak, so we can get a working version up without drowning in frontend grunt work. The goal's a clean, straightforward interface that feels like it's helping you, not fighting you, perfect for farmers or gardeners who just want answers, not a coding lesson.

5.4. Accuracy Evaluation

When it's time to test the Plant Disease Detector ML Web App, we're not messing around, we need to know if this thing can actually tell a sick plant from a healthy one, no bullshit. Accuracy evaluation is the gut check: we'll grab a stack of images the app's never seen before, think a mix of crispy, disease-riddled leaves and pristine ones, maybe a couple hundred pulled from datasets like PlantVillage or our own stash.

We'll fire them through the app and count how many times it gets it right. Is it pegging that rust on the wheat or calling a perfectly fine pepper plant a goner? We're shooting for a solid score, 90% or higher, because anything less means it's not ready to roll out to folks who are counting on it. This isn't just about bragging rights; it's about making sure it's a tool, not a toy.

We're not stopping at a single number, though, we're gonna dig into the details like it's a crime scene. How's it handling the tough stuff, like when blight's just starting and barely shows? Does it choke on blurry uploads from someone's shaky hands in the rain? We'll map out the wins and losses, maybe it's a rockstar with fungal diseases but stumbles on viral ones, or it's thrown off by shadows in the pic. We'll use that to tweak the model, maybe throw more of the tricky cases into training, until it's sharp across the board.

It's like tuning up a truck, you don't just check the gas and go; you kick the tires, rev the engine, and make sure it won't stall when it's hauling a load. By the end, we want an app that's not just accurate on paper but tough enough for the real world, where farmers and gardeners don't have time for guesswork.

6. Expected Outcomes

Once the Plant Disease Detector ML Web App is locked and loaded, we're expecting it to be a real win for anyone with plants on the line. The big payoff is a working tool that delivers, farmers, gardeners, and even pros will get a web app they can pull up anywhere, upload a pic, and get a straight answer on what's killing their crops, plus a game plan to fight back.

We're talking solid deliverables here: a polished Streamlit interface that's easy to use, a machine learning model humming under the hood with at least 90% accuracy, and a little user guide so nobody's left fumbling. Beyond that, we'll have the model's documentation ready, think of it as the recipe card for how we built this thing—so we can tweak it or scale it later. It's not just about slapping something together; it's about handing over a package that's legit and ready to roll.

The ripple effects are where it gets exciting. With this app, we're looking at faster disease detection—catching problems days or weeks before they'd show up on a manual sweep—which could mean the difference between a bumper harvest and a total bust. For farmers, that's less crop loss and more money in their pocket; for gardeners, it's keeping their pride-and-joy plants alive without the heartbreak.

We're betting on measurable wins: users spotting diseases early enough to save, say, 20% more of their yield, or just feeling less stressed because they've got a tool they can trust. Down the line, as we pile up feedback and data, we'll expand it, more crops,

more diseases, maybe even local quirks, turning it into a go-to for anyone with dirt on their boots. It's not pie-in-the-sky stuff; it's practical help that could shift how people protect what they grow, one upload at a time.