



Machine Learning for Human Biometrics

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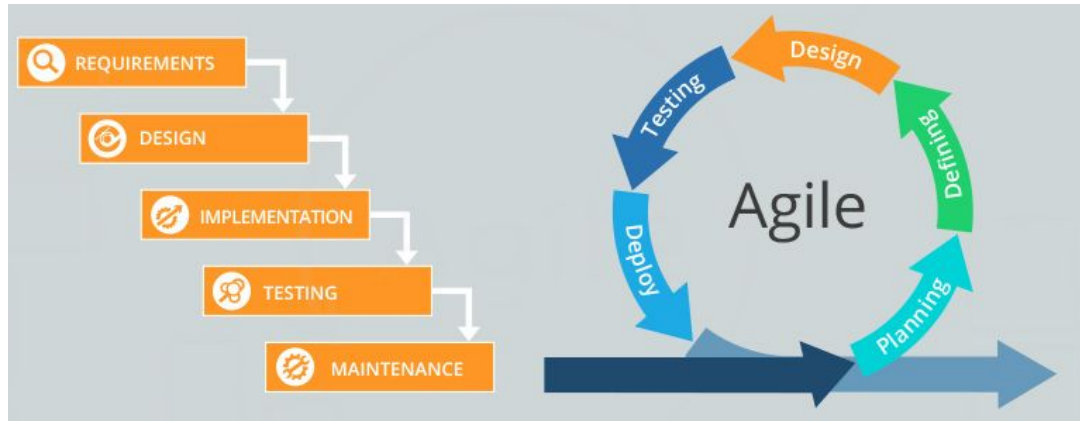
Problem Statement

- Surgeons tend to get tired if operate for long periods of time
- They also get stressed when something goes wrong in the surgery
- Our project aims to create a device to identify any abnormalities in the surgeon's eye movement, and provide appropriate advice to the surgeon to prevent potential human error



Project Management Style

- Waterfall+Agile
 - Overlapped tasks
 - Some tasks needs to be completed to move on to the next task
- Example
 - We need to first set up the database environment, and then we can run the ML algorithm and store the generated data, and finally review the data



Task Decomposition

Hardware	<ul style="list-style-type: none">- Connect the microcontroller with a camera.- Check the connection between the board and a monitor.- Work on FPGA for visual processing.	<ul style="list-style-type: none">- Camera run and display image with little delay. Projected delay < 10 ms.- Increase visual processing speed by at least 1.5 times.
Machine learning	<ul style="list-style-type: none">- Set up environment and install modules required to run machine learning algorithm- Optimize machine learning algorithm	<ul style="list-style-type: none">- Machine learning algorithm runs with < 5% inaccuracy- Process 30 to 60 fps video

Task Decomposition

Database	<ul style="list-style-type: none">- Set up database environment- Integrate database into the rest of the system- Perform testing on the database	<ul style="list-style-type: none">- Accept a constant stream of data from REMoDNaV- Perform a constant stream of queries- Provide data visualization
Security	<ul style="list-style-type: none">- Research the legalities of working with human biometrics- Determine the authentication method to access the database- Determine the frequency of authentication to access the database	<ul style="list-style-type: none">- Grant database access to relevant parts of the system- Verify key and grant/reject permission- Make sure our project doesn't violate any laws

Risk/Risks Mitigation

Task	Risk	Probability	Impact	Mitigation Strategies
Database	InfluxDB crashing	0.2	High	Have a backup database to create redundancy
Machine learning	Machine learning algorithm crashing	0.1	High	
	Machine learning algorithm inaccuracy	0.5	Moderate	Intensive training and testing with larger datasets
Hardware	Ultra96 overheating	0.1	High	Attach a cooling system
Security	Data leak	0.1	High	Use encryption for our data

Personnel Effort Level

Database	Research and select database for project	1	8
	Set up the database environment	1	2
	Integrate the database to the rest of the system	3	6
	Write code to perform required functionalities	2	6
	Testing the database	5	8
Ultrag6 microcontroller	Select and purchase microcontroller	1	4
	Do smoke test on microcontroller	1	4
	Select and purchase video camera	1	4
	Integrate database	2	4
	Set up microcontroller for project	1	8
	Integrate machine learning algorithm	3	6
	Test and polish	5	8

Personnel Effort Level

Machine learning algorithm	Set up the environment, install modules, and import datasets to run the algorithm	2	4
	Understand machine learning algorithm	2	4
	Train the machine learning algorithm with larger dataset	2	8
	Optimize machine learning algorithm	5	8
Security	Research ways to secure information transfer	1	2
	Integrate security in database	2	4
	Test integrated security	5	6
	Fine tune security	5	4



Thank You