OpenPosture

The ultimate solution for improving your seated posture and reclaiming your comfort and confidence.

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Problem

54% of office workers experience neck pain due to inadequate seated posture

Low back pain is the **leading** cause of disability across the globe

80% of people will experience debilitating lower back pain during their lifetime.

The Big 4 Accounting Firms do **not** offer a seated posture tool to enhance corporate wellness and productivity.

WHAT IS OPENPOSTURE?

- OpenPosture is an innovative **application** that aims to **enhance seated posture and productivity** of **busy students and the corporate workforce** by alleviating back and neck pain through **real-time video monitoring** or **photo submission**.

Business Model:
OpenPosture will market to

Corporate Workforce

Busy Students

SOLUTION

- To utilize OpenPosture, users simply open the app on any device equipped with a camera and capable of downloading apps. They position the device laterally to their desk, ensuring their full body is captured in the camera frame. OpenPosture then detects the user's posture and provides 1) tailored recommendations to improve their posture and 2) exercises to alleviate pain caused by poor posture.

BASED ON

- Back Position
- Neck Position
- Crossed Legs
- Feet on Floor
- Hands Folded

Future Plans: Key Partners

Chiropractors across USA

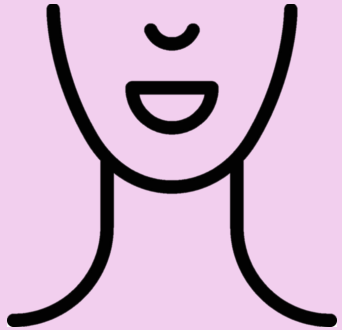
UMKC Sports Medicine Staff

Global Corporate Wellness Programs

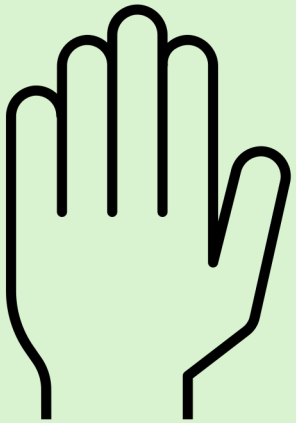
UMKC

Deloitte.

Dataset Methodology

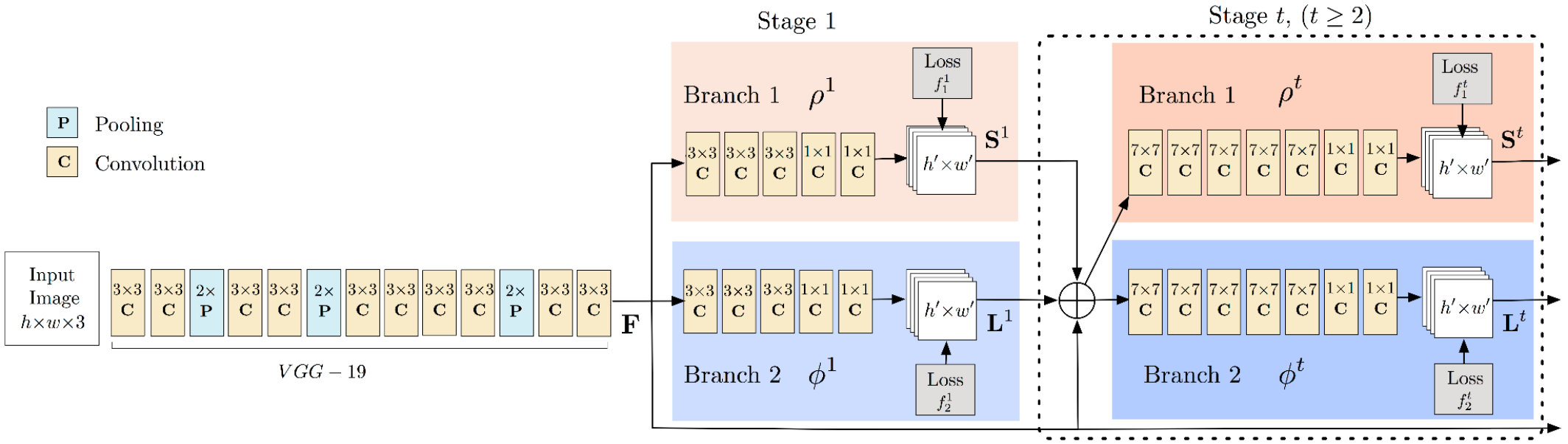


Dataset Methodology



Dataset Methodology

Seated Posture Technical Model



Results Methodology

OpenPosture developers compared the output of the model to the actual posture to create a confusion matrix and determine the percent correct, percent incorrect, true positive rate, false positive rate, true negative rate, false negative rate, specificity, sensitivity, and recall.

Results: Kneeling

Kneeling Confusion Matrix		
	Kneeling	Not Kneeling
Kneeling	2	0
Not Kneeling	2	16

2 instances were incorrectly classified as "Not Kneeling" when they were actually "Kneeling". This was because the images used to test accuracy were in between kneeling and not kneeling. OpenPosture developers classified kneeling as anytime the toes were positioned behind the knees.

Results Back

Back Confusion Matrix		
	Hunched/Reclined	Straight
Hunched/Reclined	12	0
Straight	0	8

Notable Findings: Perfect accuracy because images used to test the model were clearly forward, backward, or straight.

Results: Hands

Hands Confusion Matrix		
	Folded	Not Folded
Folded	3	0
Not Folded	3	14

3 instances were incorrectly classified as "Not folded" when they were actually ”folded". This was because several of the photos used to test accuracy appeared to be parallel when they were actually folded. Fine tuning the model to better detect crossed hands and mitigate the parallel effect is an area of future work for the OpenPosture developers.

Results: Neck

Neck Confusion Matrix		
	Forward/Backward	Straight
Forward/Backward	4	2
Straight	0	14

2 instances were incorrectly classified as “forward/backward” when the neck was actually ”straight.” This was because in some cases, the neck was between forward/backward and straight, and thus the model selected the angled position. This isn’t too harmful to the user, because extra workout recommendations can’t hurt!

Results Summary

Posture	n	Precision	Recall	Specificity	Sensitivity	Percent Correct	Percent Incorrect
Kneeling	20	1	0.89	1	0.89	90%	10%
Back	20	1	1	1	1	100%	0%
Hands	20	1	0.82	1	0.82	85%	15%
Neck	20	0.88	1	0.67	1	90%	10%

OpenPosture was able to achieve at least 85% accuracy for all postures tested!

Future Work

Object Detection: Integrating real-time object detection capabilities within the OpenPosture system would enhance its ability to recognize and provide insights on specific objects in the user's environment. Such insights might include lowering the chair, raising the desk, or moving the keyboard forward to enable better posture and mitigate pain.

Single-Device Use: Optimizing OpenPosture for single-device use could eliminate logistical challenges for users with a single device and streamline the user experience by removing the need for additional hardware.

Camera Positioning Guidance: Incorporating visual aids, instructions, or alarms/audio cues within the app to assist users in positioning the camera effectively would improve posture assessment accuracy.

Customization: Offering customization options within the app regarding workout capabilities, known medical diagnoses (e.g., scoliosis), age, or physical characteristics (e.g., amputated body part) would cater to diverse user preferences and needs.

Subscription Management: Establishing and allowing options for different subscription plans would allow users to choose the version of the app that best suits their needs and financial interests.

Conclusion

OpenPosture successfully improved upon the source code created by the MIT developers by adding additional postural components and workout recommendations. The developers achieved at least 85% accuracy for all postures tested. There are areas for future work if manufacturing a profitable OpenPosture product.

Team Contributions and GitHub

- Team members Ally Ryan, Michael Nweke, and Parisha Rathod all contributed equally to this project. Notable tasks for each member include:
  - **Ally Ryan:** project management, main deliverable creator (poster, summary and technical reports), workout recommendation researcher, business venture video and powerpoint development, results code development and output
  - **Parisha Rathod:** Neck code developer, researchathon attendee, tested data for accuracy, created final poster, assisted with deliverables (summary and technical reports and powerpoints)
  - **Michael Nweke:** Main backend and frontend developer, created demo videos, tested data for accuracy

Team GitHub (members linked):

- https://github.com/m-nweke/CS5588-Capstone-Project