Mobile Fall Detection for Physical Therapists

Vision Statement

STOP! 36 million older Americans from falling down and getting hurt.

Mission Statement

Automate fall risk screening tools in a mobile app for faster, less expensive fall risk detection.

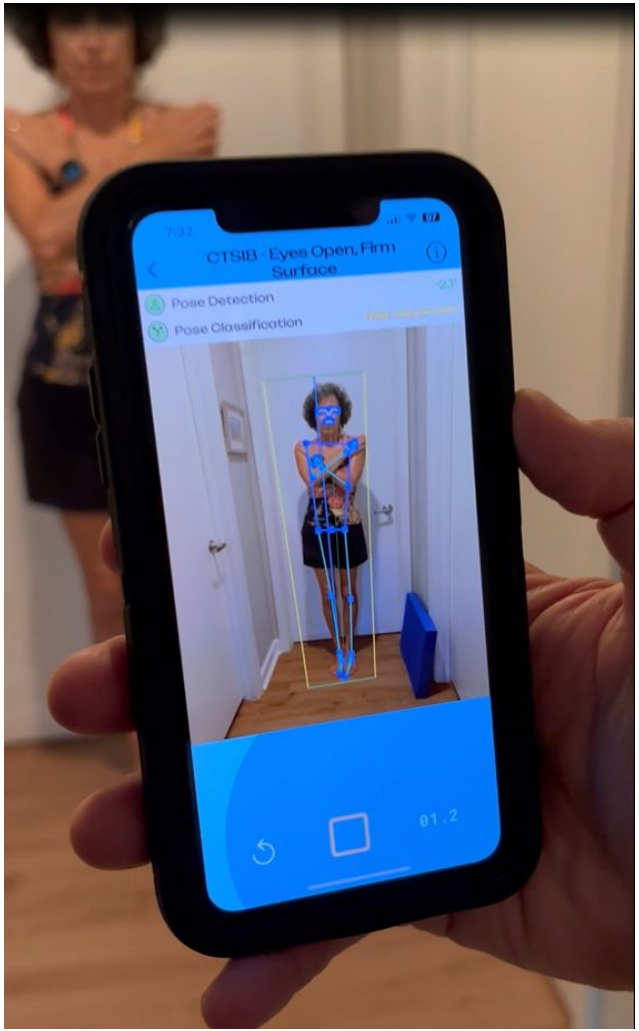
1000X fall risk detection

What Problem Does VisualPT Solve?

An epidemic of Falls in older people:

- Every 11 seconds an older person has a Fall with injury.
- E-room visits from a Fall cost $14,165.87
- 1 in 4 older adults report falling every year.
- ~9 million falls with injury per year.

Dad



Solution

A 2-minute assessment using

Computer Vision to replace a

20 minute pen-and-paper

process.

How Big is the Market?

Total Addressable Market (TAM):

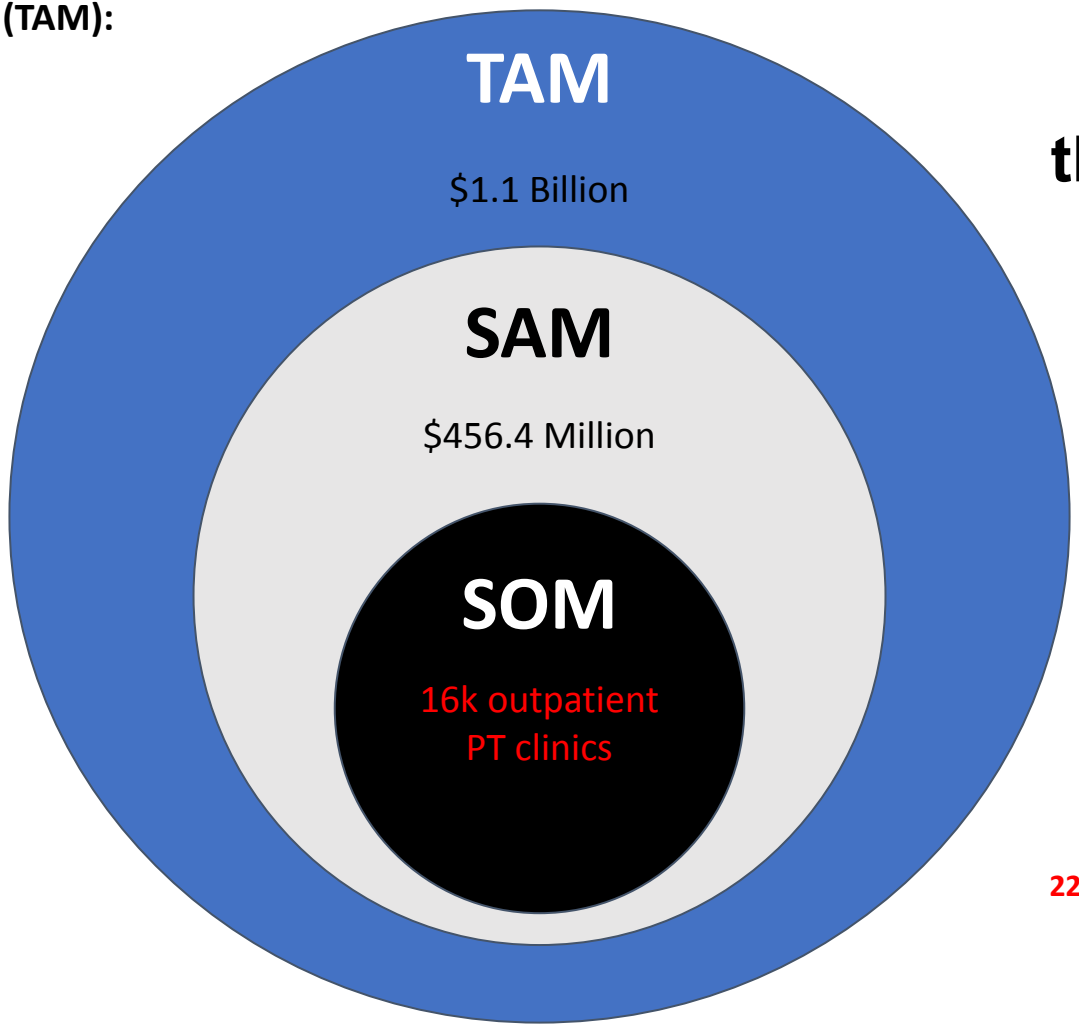
Global Physical Therapy software market

- $1.1 billion

Serviceable Available Market (SAM):

USA PT software

- $456.4 million



Serviceable Obtainable Market (SOM):

16,000 outpatient PT clinics

22,000 skilled nursing facilities

5,000 hospitals

Outpatient Physical Therapy clinics

16,000 locations in the USA (market data)

X 10% market capture

==========

1600 locations in 2 years

X $50 per licensed PT per month

(note: most locations have more than 1 PT)

==========

$600 annual revenue per customer

X 1600 customers

==========

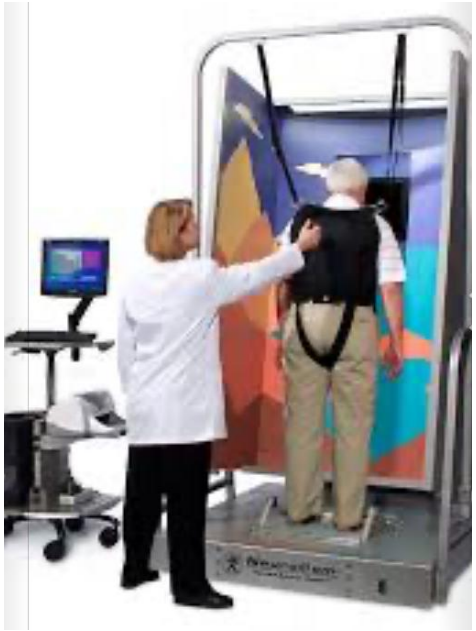
$960,000 annual revenue, 2 year run rate

10% market capture in 24 months

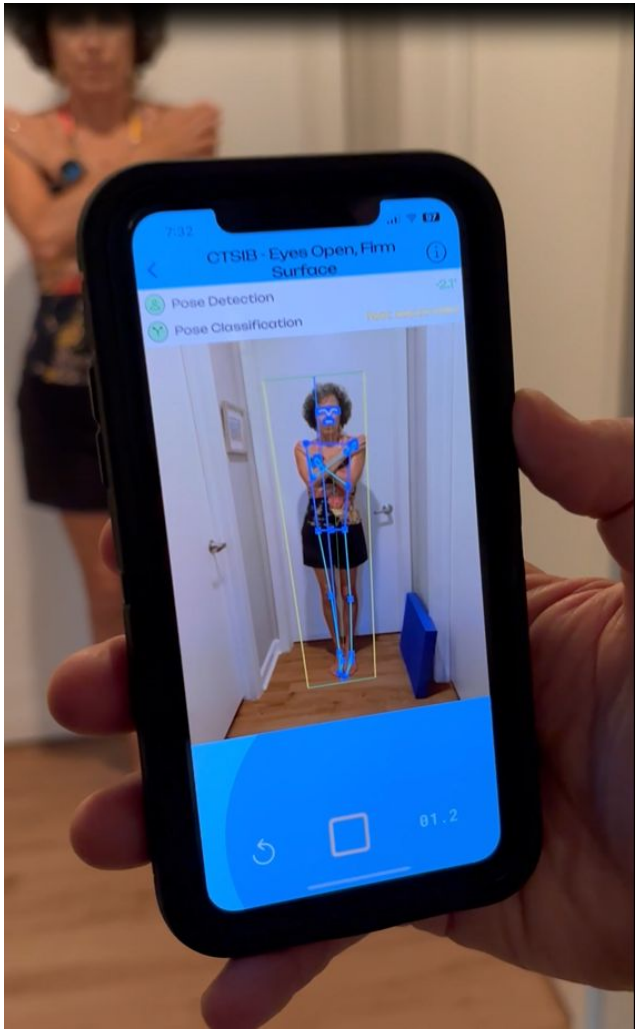
Competition

Bertec: Cost: $87,000
Time: 15 min.

Natus / NeuroCom: $20,000 (used)
Time: 15 min.



BodiTrak: Cost $5,000
Time: 15 min.



VisualPT.ai advantages

- 10x less expensive
- Mobile, not fixed.
- Direct measure, not a calculation
- No End User maintenance (Apple App store)
- Smaller footprint than force plates
- Faster than force plates
- Direct link to EMR thru wireless API

Regulatory Review

HIPAA Compliant

- Trusted, third-party platform (AWS)
- 2-factor authentication
- NO patient data (names, emails, diagnoses, tec) are retained in the system.

Food & Drug Administration

- Approval <u>not needed</u>. The app is a screening device, not a diagnostic device.

Institutional Review Board (IRB)

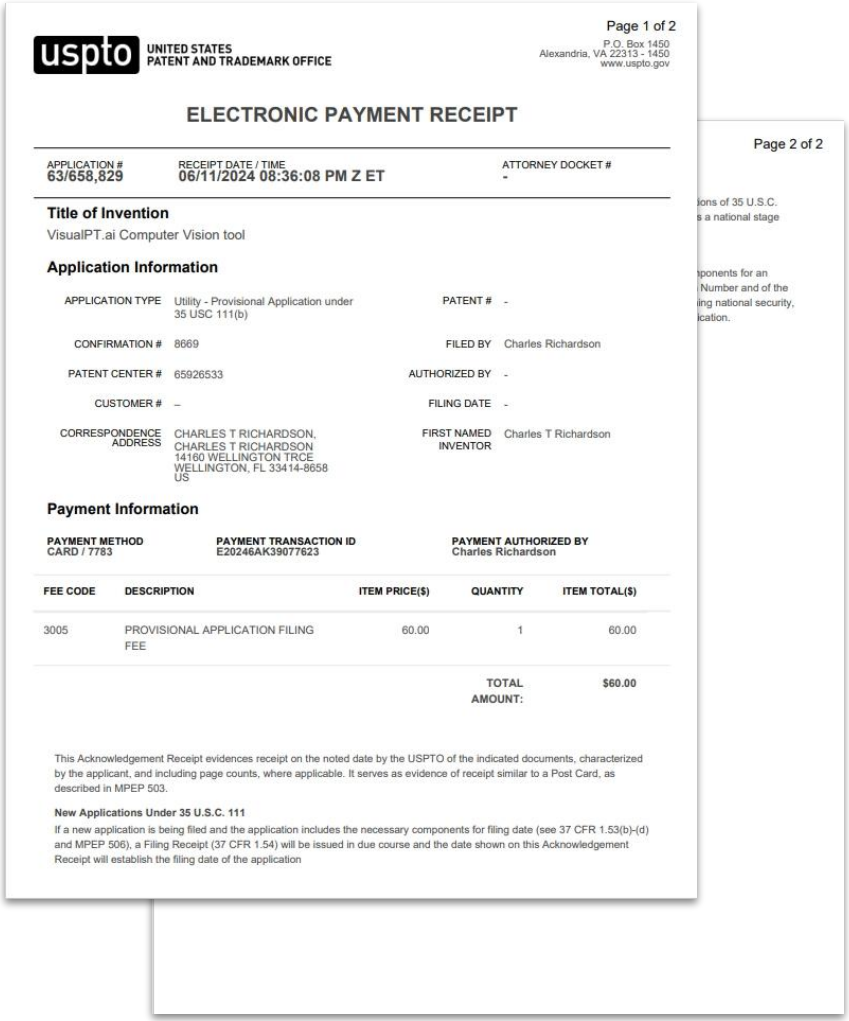
"CTSIB is already a validated test; well-known in the PT community. At this time, there is no need for IRB approval to begin validation & data collection."

- Dr. Mark Bishop, Chairman, UF Dept. of PT

Patent Pending

Provisional patent #: 65/658,829

Expiration date: June 11, 2025



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UNITED STATES PATENT AND TRADEMARK OFFICE

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ELECTRONIC PAYMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
63/658,829	06/11/2024 08:36:08 PM Z ET	-

Title of Invention

VisualPT.ai Computer Vision tool

Application Information

APPLICATION TYPE	Utility - Provisional Application under 35 USC 111(b)	PATENT #	-
CONFIRMATION #	8669	FILED BY	Charles Richardson
PATENT CENTER #	65926533	AUTHORIZED BY	-
CUSTOMER #	–	FILING DATE	-
CORRESPONDENCE ADDRESS	CHARLES T RICHARDSON, CHARLES T RICHARDSON 14160 WELLINGTON TRCE WELLINGTON, FL 33414-8658 US	FIRST NAMED INVENTOR	Charles T Richardson

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
CARD / 7783	E20246AK39077623	Charles Richardson

FEE CODE	DESCRIPTION	ITEM PRICE($)	QUANTITY	ITEM TOTAL($)
3005	PROVISIONAL APPLICATION FILING FEE	60.00	1	60.00
			TOTAL AMOUNT:	$60.00

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

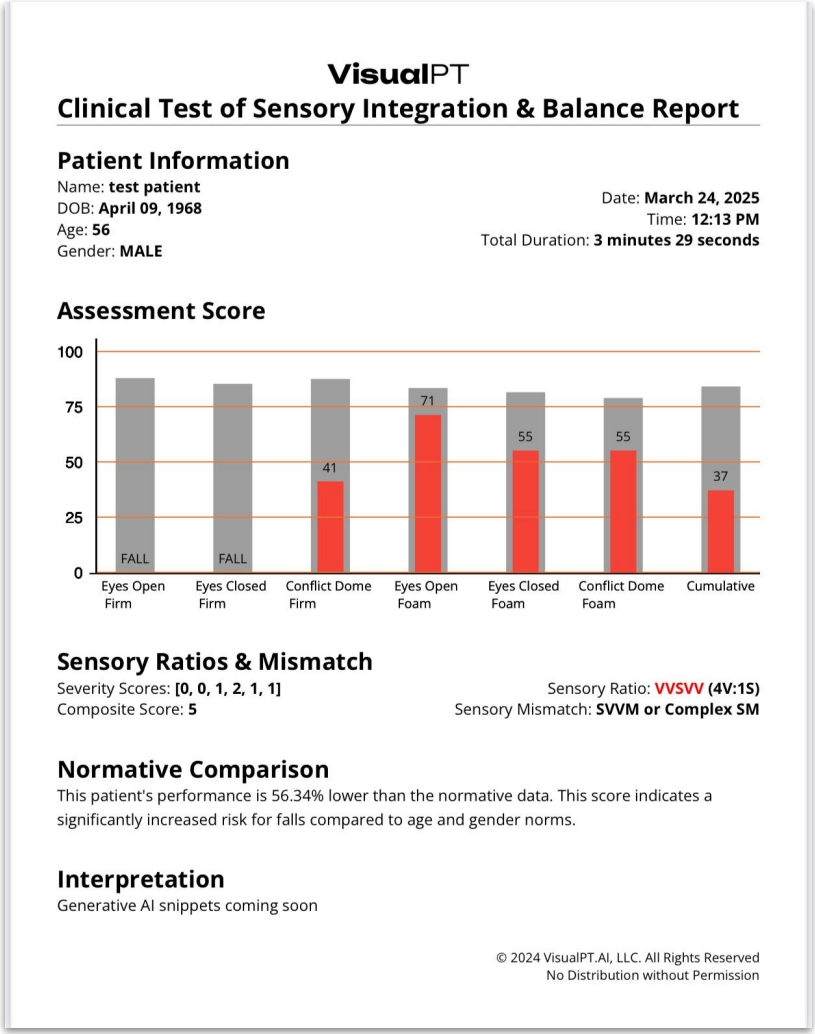
New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

Page 2 of 2

Written PDF Report

- **Insurance reimbursement:** Billable as CPT code 97750 = $33.57 / unit
- Supports Medical Necessity for Physical Therapy (paid by Medicare)
- Identifies High Fall Risk Seniors
- Mandated and paid MIPS fall risk reporting by primary care physicians, nurses, physical therapists, occupational therapists in all settings (hospital, skilled nursing, outpatient clinics, etc.)



VisualPT

Clinical Test of Sensory Integration & Balance Report

Patient Information

Name: **test patient**
DOB: **April 09, 1968**
Age: **56**
Gender: **MALE**

Date: **March 24, 2025**
Time: **12:13 PM**
Total Duration: **3 minutes 29 seconds**

Assessment Score

Sensory Ratios & Mismatch

Severity Scores: **[0, 0, 1, 2, 1, 1]**
Composite Score: **5**

Sensory Ratio: **VVSVV (4V:1S)**
Sensory Mismatch: **SVVM or Complex SM**

Normative Comparison

This patient's performance is 56.34% lower than the normative data. This score indicates a significantly increased risk for falls compared to age and gender norms.

Interpretation

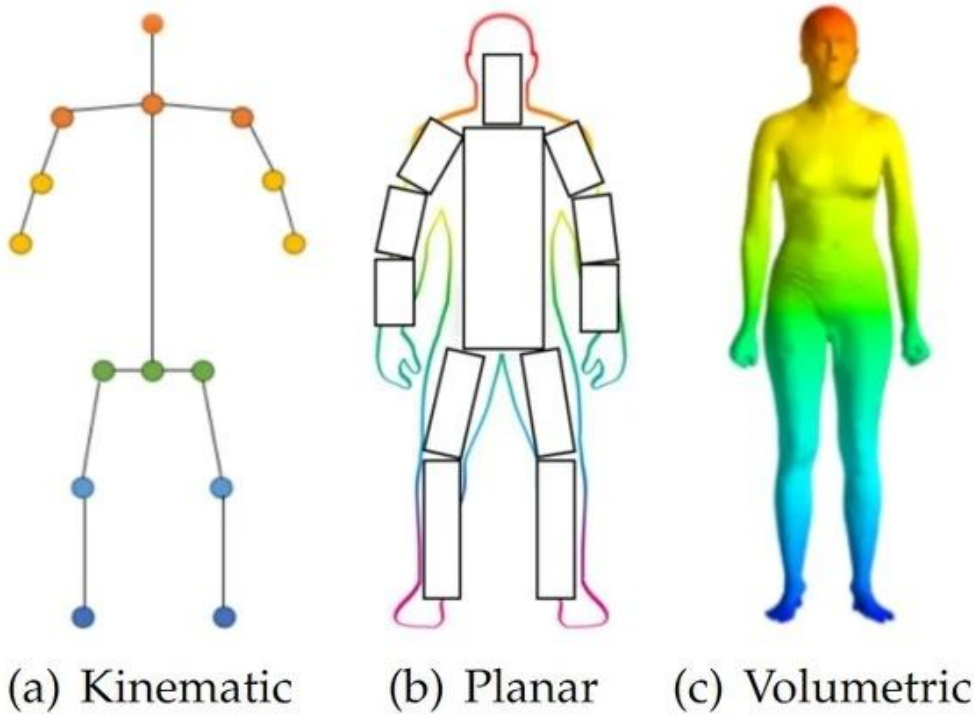
Generative AI snippets coming soon

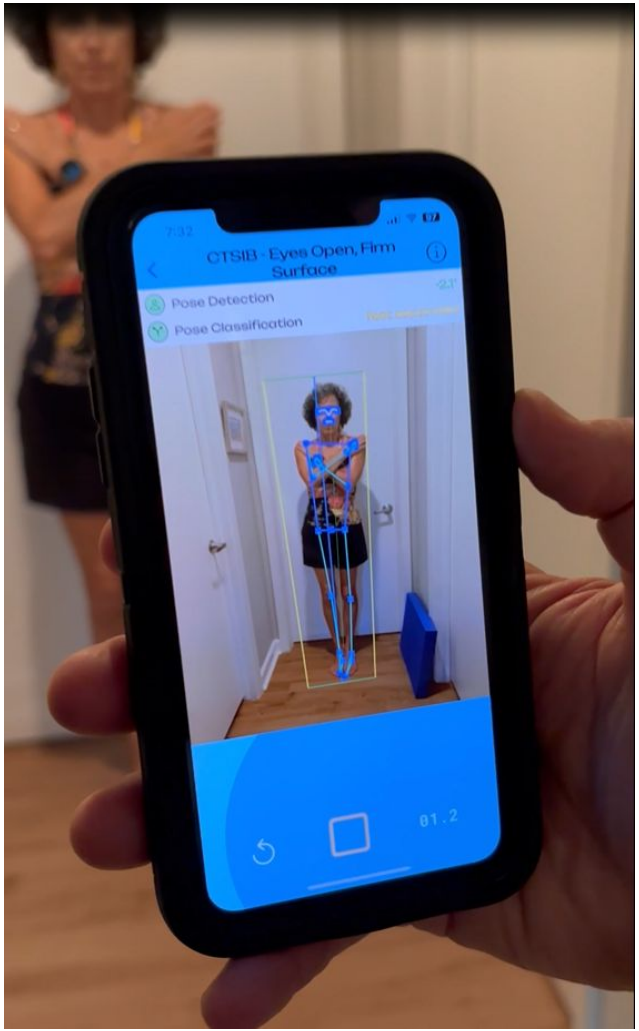
Roadmap

1. **Z-axis (depth) measurement** - customize Google MediaPipe
2. **Gyroscopic image stabilization** - no need for a tripod.
3. **Add new Tests:** Industry Gold Standards - no more manual tests.
4. **Integrations:** Build API data pipeline to EMRs - no more paper.
5. **Add Generative AI:** Clinical Summaries will reduce keyboard time.

Z-axis (depth) measurement

(Z-axis depth measurement in process)





Gyroscopic Image Stabilization

(without needing a gimbal)

Add New Tests

Berg Balance Test

Machine Learning model collapses **14** test items down to **4** items (1 already collected on the CTSIB).

sensors

MDPI

Article

Automatic and Efficient Fall Risk Assessment Based on Machine Learning

Nadav Eichler [1,*], Shmuel Raz [2], Adi Toledano-Shubi [3], Daphna Livne [3], Ilan Shimshoni [2] and Hagit Hel-Or [1]

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[2] Department of Information Systems, University of Haifa, Haifa 3498838, Israel; razshmus@gmail.com (S.R.); ishimshoni@is.haifa.ac.il (I.S.)
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* Correspondence: eichler@outlook.com

Abstract: Automating fall risk assessment, in an efficient, non-invasive manner, specifically in the elderly population, serves as an efficient means for implementing wide screening of individuals for fall risk and determining their need for participation in fall prevention programs. We present an automated and efficient system for fall risk assessment based on a multi-depth camera human motion tracking system, which captures patients performing the well-known and validated Berg Balance Scale (BBS). Trained machine learning classifiers predict the patient's 14 scores of the BBS by extracting spatio-temporal features from the captured human motion records. Additionally, we used machine learning tools to develop fall risk predictors that enable reducing the number of BBS tasks required to assess fall risk, from 14 to 4–6 tasks, without compromising the quality and accuracy of the BBS assessment. The reduced battery, termed Efficient-BBS (E-BBS), can be performed by physiotherapists in a traditional setting or deployed using our automated system, allowing an efficient and effective BBS evaluation. We report on a pilot study, run in a major hospital, including accuracy and statistical evaluations. We show the accuracy and confidence levels of the E-BBS, as well as the average number of BBS tasks required to reach the accuracy thresholds. The trained E-BBS system was shown to reduce the number of tasks in the BBS test by approximately 50% while maintaining 97% accuracy. The presented approach enables a wide screening of individuals for fall risk in a manner that does not require significant time or resources from the medical community. Furthermore, the technology and machine learning algorithms can be implemented on other batteries of medical tests and evaluations.

Keywords: fall risk detection; balance; Berg Balance Scale; human tracking; elderly; telemedicine; diagnosis

check for updates

Citation: Eichler, N.; Raz, S.; Toledano-Shubi, A.; Livne, D.; Shimshoni, I.; Hel-Or, H. Automatic and Efficient Fall Risk Assessment Based on Machine Learning. *Sensors* **2022**, *22*, 1557. https://doi.org/10.3390/s22041557

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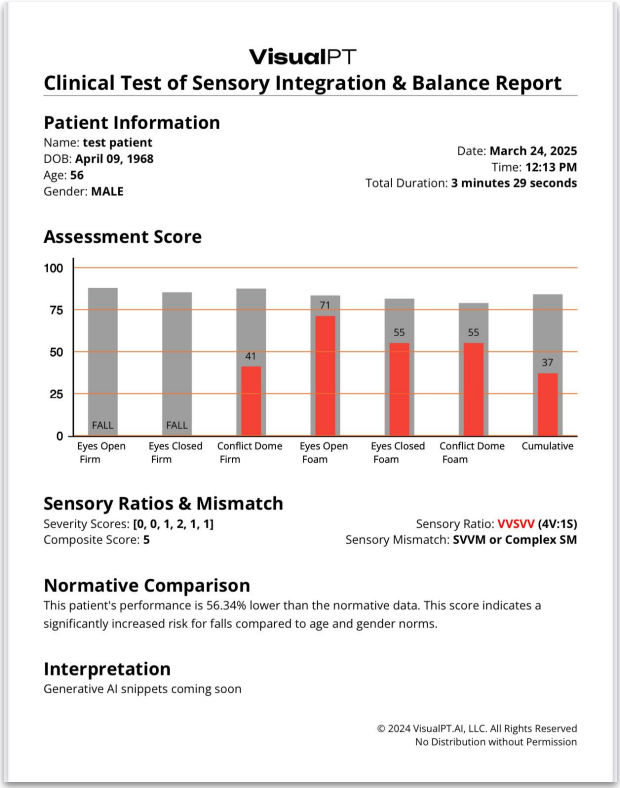
1. Introduction

Accidental falls are a major concern in the elderly population, often requiring hospitalization, and may lead to death [1,2]. Falls are one of the main causes of disability, loss of independence, and reduced quality of life. This incurs high expenses on the individuals, their families, and the public health system [3,4]. It has been shown, however, that individuals can significantly reduce the risk of fall by participating in fall prevention programs [5,6]. Thus, there is great importance in performing a wide screening of the elderly population for the risk of fall and, consequently, initiating appropriate intervention programs.

Assessing the risk of fall is typically performed by physiotherapists and other types of medical professionals using various standardized and validated balance tests. One such test is the Berg Balance Scale (BBS) [7,8], a rigorous and time-consuming examination, since it requires the patient to perform 14 different tests. Due to its demand on the medical professional resources, these tests are not widely performed on the general public and are typically administered in the context of rehabilitation. Thus, more efficient testing

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8875808/pdf/sensors-22-01557.pdf

Integrations



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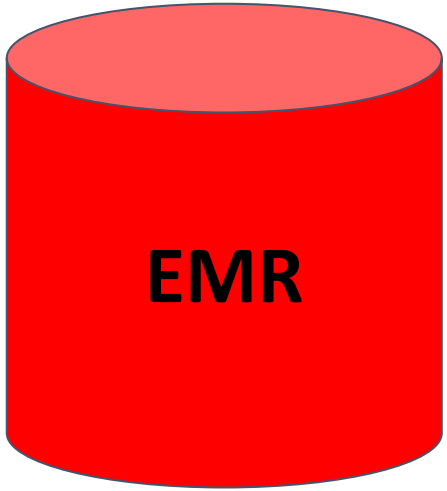
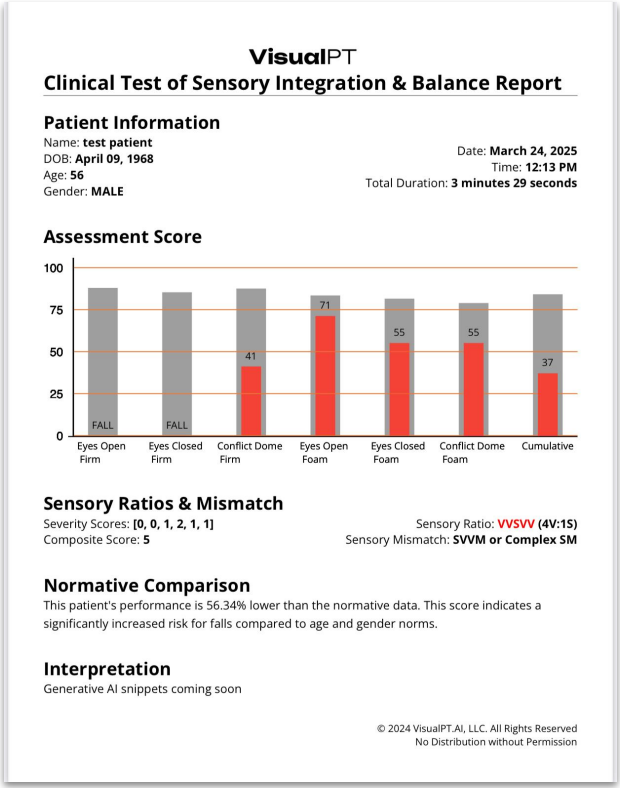


Add Generative AI



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Pre-filled 75% of the Daily PT Note

Raw data - supplements the “O”

Assessment data - supplements the “A”

Fall Risk data - supplements the “P”

Team

Charles Richardson, Founder

UI/UX front-end developer, software engineer, Python, Flutter, JavaScript

Holly Scott, Principal

Vice President & Partner at The Mullings Group | Global Medical Device & Life Sciences | Executive Search-Building Companies and Careers

Tim Richardson, Consultant

Physical Therapist & Franchise Regional Consultant, FYZICAL LLC.

Balance & vestibular expert, project manager

Thank you!

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