Digital biomarkers to measure cognitive outcomes

Altoida Inc., Altoida AG

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Altoida has developed a platform for digital biomarkers measuring cognitive outcomes using smartphone sensors. We have validated the technology in Alzheimer’s Disease (AD) and are able today to predict the onset up to 6 years prior to symptoms with 94% accuracy.

We are now exploring adjacent neurodegenerative diseases such as PD, TBI, ADHD, Strokes and Depressions.
What if you could detect Alzheimer’s up to 6 years prior to its onset, using an iPhone only?

At Altoida we have developed an instrumental activities of daily living (iADL) methodology based on longitudinal clinical studies with more than 2700 patients at risk over a period of 8 years.

After taking an iPhone app based test for 10 minutes, we are able to tell you if you will develop Prodromal AD within 6 years from now with an accuracy of 94%.
Using digital biomarkers to measure cognitive outcomes

**Introduction.** Based on 8 years time series data from clinical trials with more than 2722 patients we have developed a high-dimensional outcomes model using machine learning: **Neuro Motor Index (NMI)**

We are going to address two markets, deploying this technology using smartphone apps:

- Doctors/Neuro Specialists: Medical device (FDA 510k) to improve AD early screening
- Consumers (OTC): AD risk scoring

**Technology.** Augmented reality assisted test that tracks gamified daily routines through motor execution trajectories while navigating and visuospatial function. Prediction: presymptomatic AD up to 6-8 years. Accuracy: 94%.

**Use Cases**

- **Prevention / Early Screening**
  Access to earliest possible AD/MCI cohort

- **Disease Monitoring**
  Most accurate and scalable way to track disease progression
**Roadmap**

**Science & Research 2007 - 2015**

- Longitudinal EU funded studies at 22 sites with 4500 candidates (2700 AD prodromal)
- 12 publications in major journals
- 240 independent publications supporting our methods
- Initiated collaboration with Global Brain Health Institute in 2016 to join 10'000 cohort TILDA study
- Endorsed by Alzheimer’s Association (US) and Alzheimer’s Europe

**Productization**

- 2016: iPad & iOS App development
- 2017: FDA 510k (US) and MDR (EU) clearance. Start sales of Altoida research device.
- 2018: Start sales of medical device for doctor’s office
- 2019: Start sales of OTC consumer version
Research tool using digital biomarkers to measure cognitive outcomes

At Altoida we have developed an instrumental activities of daily living (iADL) methodology that uses a combination of cognitive and functional biomarkers.

Using iPhone/iPad accelerometer and gyroscope and touch screen sensors, we are measuring

- Executive Functions
- Spatial Memory
- Psychomotor Processing Speed
- Prospective Memory
Product Preview: Altoida iOS
3 Batteries of Everyday Function Tests

Test: Hide-n-Seek
Assessment: Spatial Memory
Description:
1. Hide 3 virtual objects in real-space.
2. Find them back in a random order.
3. Avoid environmental distraction.

Test: Fire evacuation drill
Assessment: Prospective Memory
Description:
Learn a specific order of an evacuation scenario using virtual actions: 1. activate alarm, 2. call fire brigades, 3. save documents.

Test: Dual task condition
Assessment: Psychomotor Processing Speed
Description:
While performing one of the two test batteries, the patient is asked to tap the speaker icon when he hears a sound signal. The patient needs to discriminate low from high pitch signals.
Product Preview: Dashboard

Patient Report: Neuro Motor Index

One single score: Neuro Motor Index
Total NMI score resulting from combination of all all features from the test batteries.

- Green = Healthy
- Yellow = Lower percentile healthy
- Orange = Prodromal AD risk
- Red = Prodromal AD / aMCI

Deep dive: 250 Features at 300 Hz
Heatmap of feature characteristics relative to healthy population. Features can be clicked and values are shown on the distribution plot of the healthy population.

Analyze and assess cognitive performance, manage patient data and track disease progression

Altoida’s secure and encrypted web dashboard provides access to patient measurements. No data is stored on the iOS app but secured on our HIPAA compliant cloud servers.

Measure disease progression and intervention efficacy
Feature progression over quarterly measurement cycles test batteries. Progression can be analyzed both on NMI level or each feature. High frequent measurement allows exact tracking of interventions and therapies.
Access to untapped presymptomatic data

Measure cognitive outcomes from very early visuospatial functions, currently exploring applications in AD, PD, TBI, ADHD, Strokes and Depressions

**Universities**

**Research**

**Brain Health**: Join our long-term vision to make brain health measurable and connecting the dots between fields like metabolome, microbiome, genome, brain network dynamics and behavioural markers

**CRO/Pharma**

**Clinical Trials**

**Patient Recruiting**: Inexpensive and scalable tool to identify and classify specific patient cohorts in clinical trials.

**Advanced Analytics**: Inexpensive and scalable method to assess visuospatial function and track patient cohort progressions.

**Memory Clinics**

**Personalized Medicine**

**Early Screening**: Get access to early cohorts of patients at risk and start treatment and interventions earlier.

**Personalized Medicine**: Inexpensive and scalable method to track patient cohort progressions and personalize treatment and interventions.

**Health Insurance**

**Health Innovation**

**Brand Image**: Participation in Digital Health Innovation strengthens consumer brand.

**Cost of Care**: Delay and prevention of disease onset could lower cost of care.

**Strategy**: Focussed AD practice could increase premium revenues.
Leadership: Medicine, Technology & Business Acumen

Ioannis Tarnanas Chief Scientist (CSO)
PhD in Neuroscience; focus on Alzheimer’s and cognitive performance. 15 years research Dementia & Virtual Reality and previous track record in successful start-ups. Pioneered computational (functional) biomarkers for the early screening of AD as a low cost, internet delivered and non-invasive prognostic tool.

Fabian Wahle Chief Technology (CTO)

Adrian Locher Chief Executive (CEO)
BA from University of St. Gallen (HSG) in Business, Economics and Law. Serial entrepreneur and startup investor with focus on Artificial Intelligence. As founder and COO he scaled Switzerland's biggest multi category e-commerce player to over CHF 100M sales. He was awarded "HSG Entrepreneur of the Year 2012", "Swiss E-Commerce Champion 2015" and was ranked "40 under 40" by Swiss Bilanz magazine.
Vision

Our goal is to fight and ultimately help solving what will become soon not only one of the grand challenges to our society but also the biggest burden to healthcare systems: Alzheimer’s Disease.

Our “moonshot mission” in three steps:

1. **Delay**: With Altoida Neuro Motor Index, we have developed a methodology that allows early screening of AD ahead of today’s cognitive based methods. Latest research clearly indicates that early intervention can delay the onset of the disease up to 10 years.

2. **Prevention**: Our smartphone based technology will simplify disease progression tracking and thus allow more precise and personalized treatment and interventions.

3. **Cure**: After market entry of our medical grade device through doctor’s offices, we are planning to release an OTC consumer version. This will allow us to collect data of AD patients at scale. More data should ultimately lead to better understanding of the disease and will be key to develop powerful new drugs or combine drugs with novel treatments.
Thank you.

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