



Navigate Intelligent Healthcare

Neurology

Epilepsy

10M+patients , 0.4M new cases/year

Insomnia

About 300M people suffered from insomnia to different degrees
Hospital visiting rate of sleep disorder is 26% with expected further increase

Apoplexy

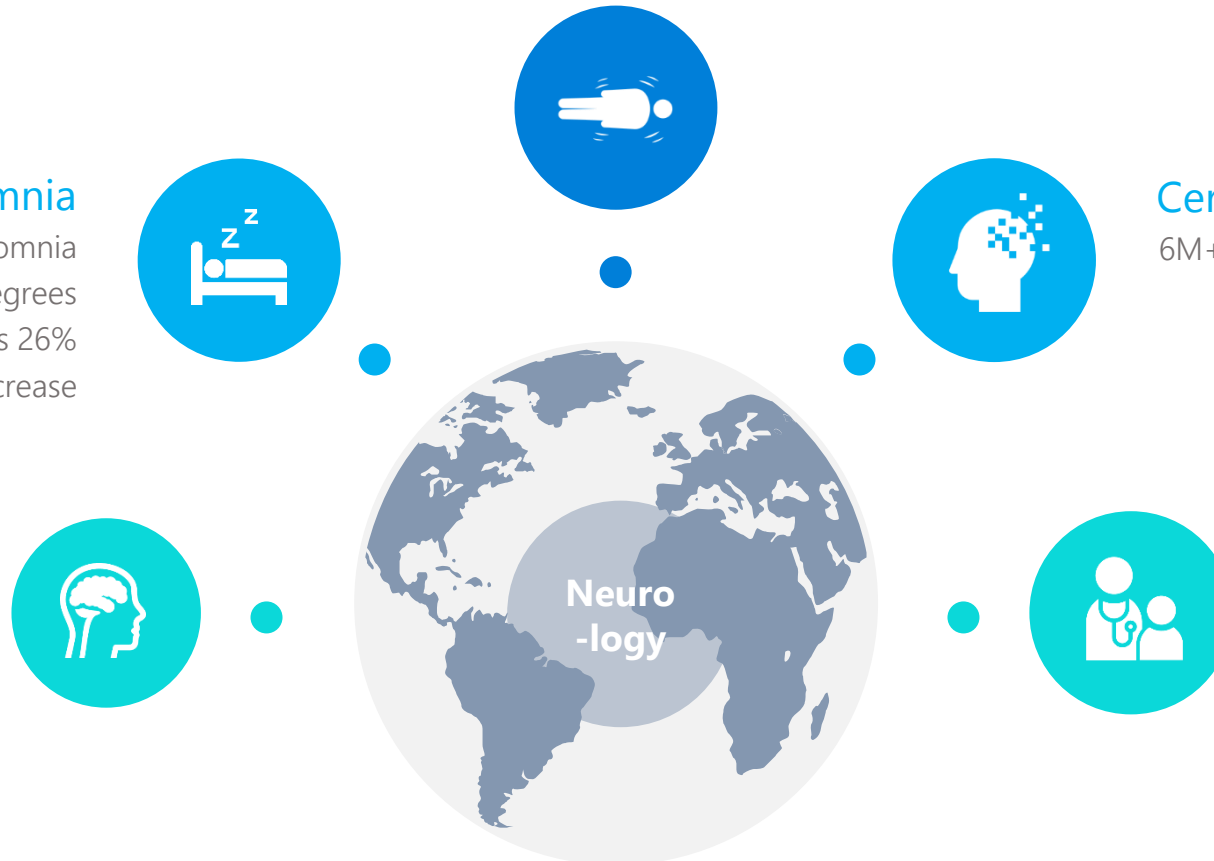
9M+patients , 1.4M new cases/year
Cerebrovascular disease has the highest mortality rate

Cerebral Palsy

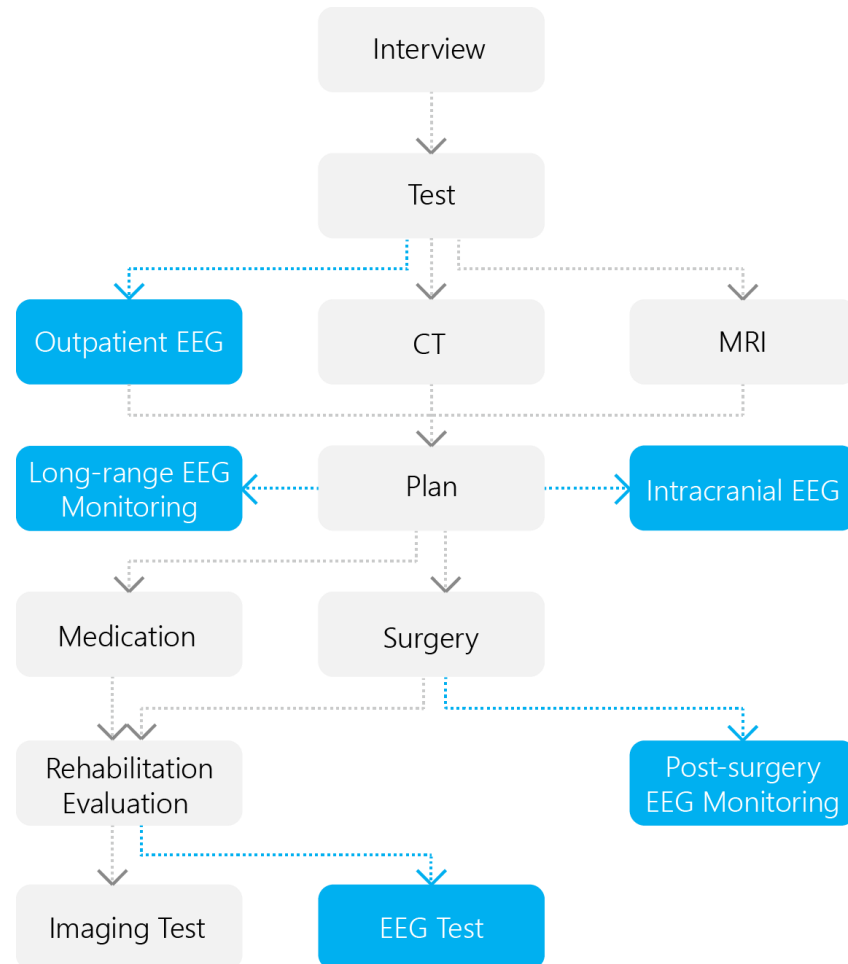
6M+patients , 100K new cases/year

Others

19.9% babies die from viral encephalitis per year ;
EEG can provide anesthesia deepness monitoring service



EEG is a key procedure, while still having lots of problems to be solved



Uneven level among primary hospitals

- Rich experiment is needed in EEG reading
- Doctors in primary hospitals is inexperienced
- Long time reading is error prone, causing misdiagnosis and missed diagnosis

Time consuming

- 10min report-generating for 20min outpatient EEG
- 2h image-reading for 24h EEG
- Outpatient EEG is transitioning to long-range EEG

Family accompany burden

- Full-time family member accompany is needed
- Missing is easy to occur in manual marking of onset period

Target Customer

High End Hospital

Enhancement in efficiency and detection capability

Introduce AI to improve service quality

Hospital

Hospital

Midrange Hospital

Hierarchical Medical System: basic test / outpatient subsidence

EEG monitoring is of high ROI, but the lack of EEG-reading physicians is a bottleneck

Potential Customer

Primary Hospital

Decrease in missed diagnosis to avoid treatment delay

Decrease in misdiagnosis in primary hospitals for easier referral

Gov.

Gov.

Intelligent Health Care

Enhancement in overall medical intelligence level in specific area

Enhancement in medical treatment service quality

Hospitals and Gov. have willingness to pay

Competition Landscape



Only light weight clinical function is offered

- Identification of spike and sharp
- Clinical product launched in late 2016

Clinical requirement is not met in China

- Product interface hasn't been localized, hard for physicians to use
- Advanced function like automatic report generating hasn't been realized
- Comprehensive function including test and accompany hasn't been implemented

Provide software with stronger Chinese DNA
Provide more completed suite via tech update

Market Size up to ¥ 4.3bn

	Outpatient EEG	Long-range EEG	Intracranial EEG
Examination fee	¥ 100 (0.5h)	¥ 500 (24h)	
3A hospitals	Market size: ¥ 1.6bn	Market size: ¥ 0.3bn	Highly professional, Only in <50 hosptials
2A/1A hospitals	Market size: ¥ 2.0bn	Market size: ¥ 0.3bn	

*1 : 2232 3A hospitals, 100% equipped with outpatient EEG, 20 patients/day; 40% equipped with long-range EEG, 2 patients/day

*2 : 7944 2A hospitals, 50% equipped with outpatient EEG, 10 patients/day; 10% equipped with long-range EEG, 1 patient/day

*3 : 9282 1A hospitals, 30% equipped with outpatient EEG, 5 patients/day; 10% equipped with long-range EEG, 1 patient/day

Remarkably Effective Result

Seizure detection accuracy up to **98.8%**

Characterized waveform accuracy up to **80%**

Accuracy



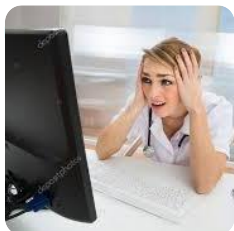
3A hospitals

- Save time
- Release pressure

1A/2A hospitals

- Reduce missed & delayed diagnosis
- Store EEG data efficiently

Efficiency



3A hospitals

- Time-consuming
- Sensitive to artifacts

1A/2A hospitals

- Missed & delayed diagnosis
- Hard for referral due to lousy storage of EEG

Analyze 1 hour EEG in **<5min**

Real time analysis of 24hour EEG
One-click reduction of artifacts

Neurology + AI: Intelligent EEG

Stage 1: Intelligent Assistant Diagnosis System

Character detection

Waveform detection
Rhythm detection

Seizure detection

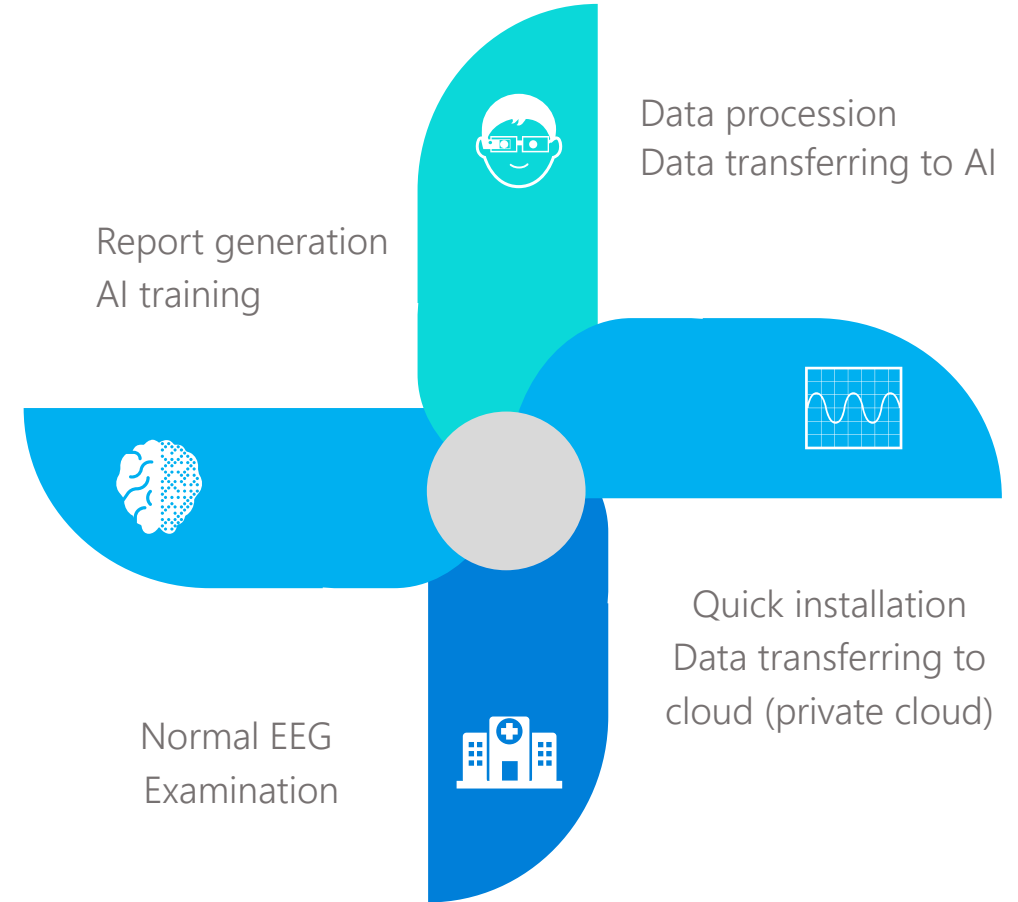
Epilepsy seizure detection
Assistant diagnosis

Artifacts reduction

MEG reduction Based on ICA

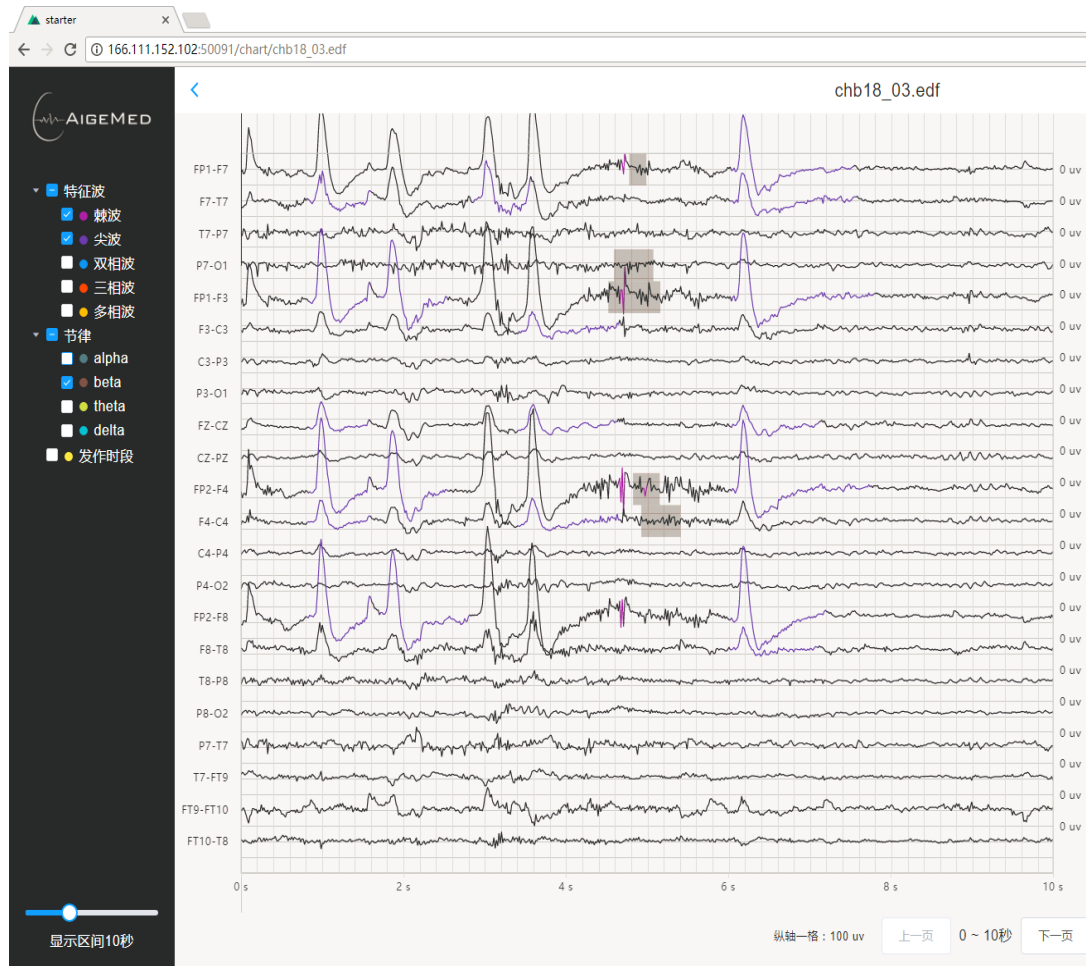
Report generation

Including background rhythm,
character detection, sleep stage
classification



Demonstration Prototyping

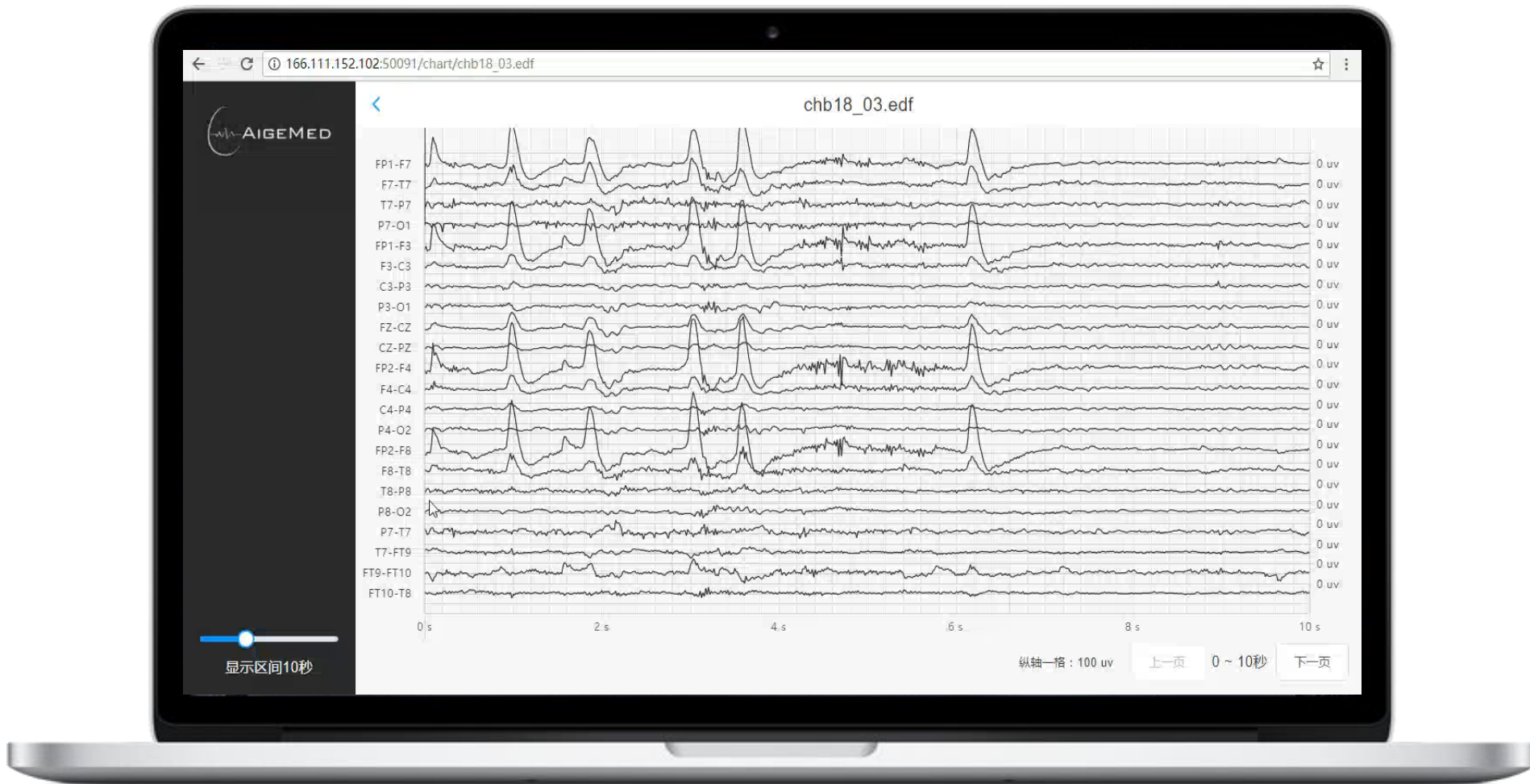
EEG Waveform Analysis



Auto-generated Report



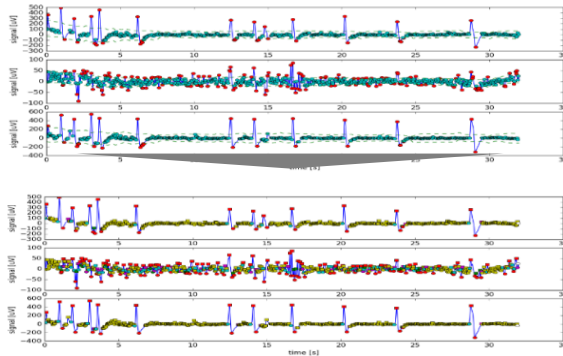
Demonstration Prototyping



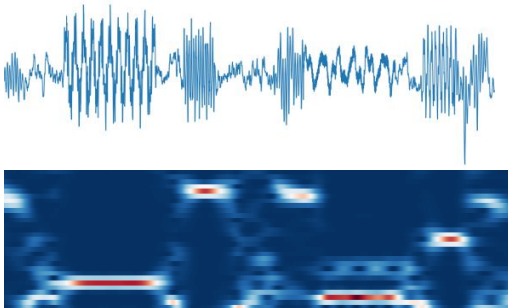
Core Algorithm

Time & Freq. Domain Analysis

Feature Extraction

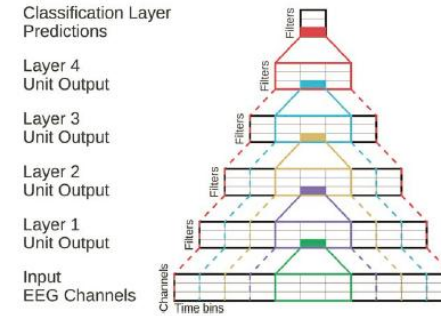


Wavelet Transform



Machine Learning

Supervised deep learning

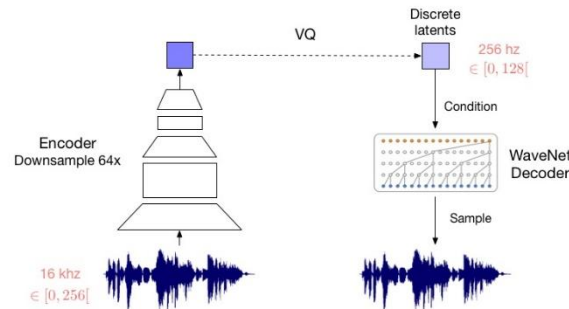


Epilepsy detection

CNN-LSTM

NLP

Non-supervised deep learning



EEG analysis

Data mining

Pathology feature extraction

VQ-VAE

Self-generating training dataset

Therapy advisory service: EEG data collection

Stage 2 : Therapy Advisory

Review every several months



At risk of drug misuse



No approach to get feedback for assessment quickly

Past

Future

Portable smart EEG machine to examine frequently

Adjustment of medicine dosage and type timely



Assessment of therapy dynamically



Collecting big data by providing low cost examination



Disease assessment for insurance company



Personalized treatment



Examination standard discovery
(AD/Epilepsy/brain development)

Business Model

Intelligent Assistant System

Elementary Version 50k/year

Characterized waveform detection

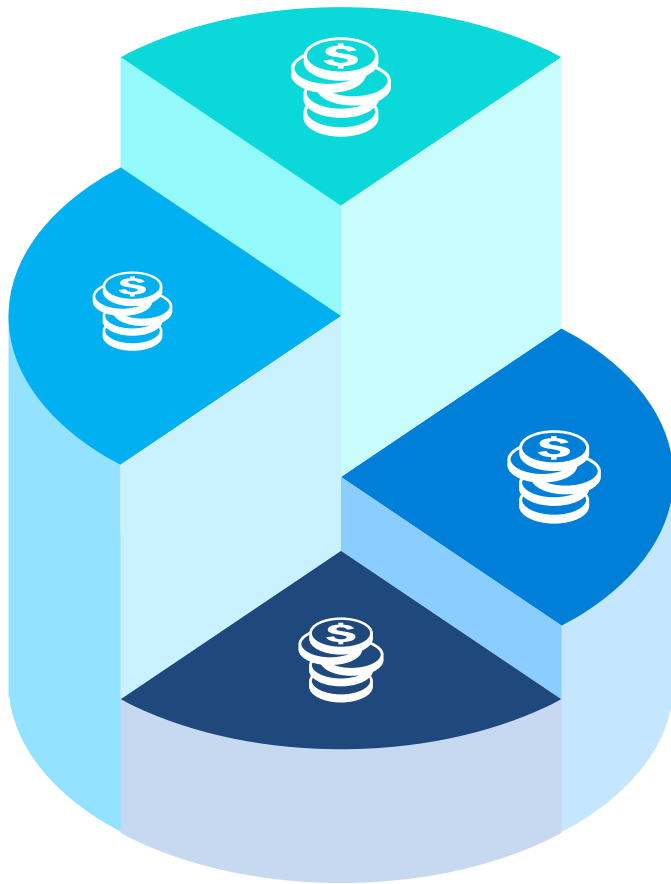
Intermediate Version 70k/year

Trends analysis
Auto-generated report

Premium Version 80k/year

Seizure detection
Intracranial EEG analysis
Medical Evaluation

Additional Account 30k/year



Smart EEG Machine

Cooperate with leading EEG
machine manufacturer



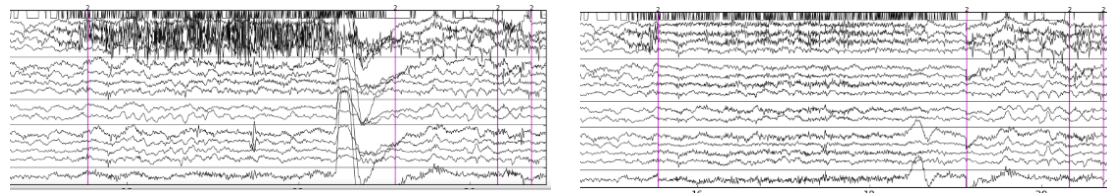
Provide intelligent assistant
diagnose module



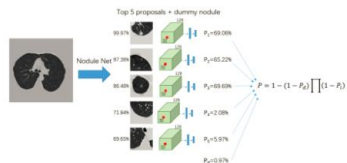
Share profit

%

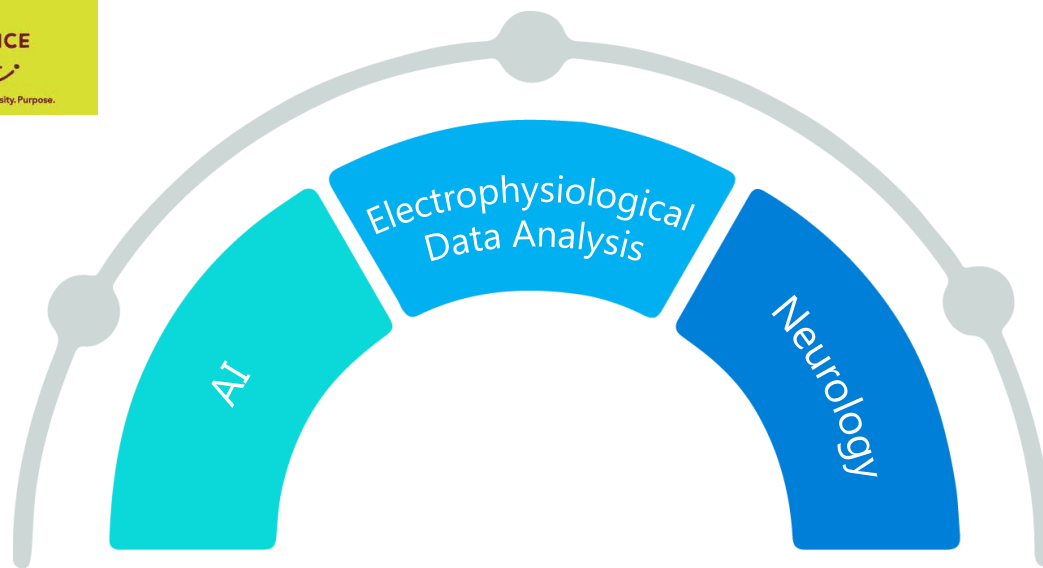
Core Technology with High Barriers



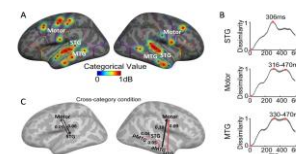
Mature & applicable tech in artifacts rejection,
noise reduction and characterized wave
extraction of EEG



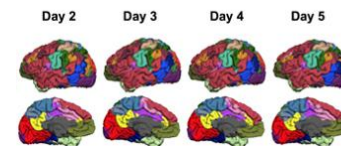
Sen's lab (chief scientist) :
**No.1 in Kaggle data science bowl
2017** (Detection of lung cancer
based on AI algorithm)



PNAS



nature
neuroscience



Bo's Lab (chief scientist) :
Leading nationwide in **neurology,**
cognitive science and brain-
computer interface

■ Deep Collaboration with Reputed Hospitals ■



R&D Partner

Product trail



首都医科大学宣武医院
Xuanwu Hospital Capital Medical University



河南省人民医院
HENAN PROVINCIAL PEOPLE'S HOSPITAL



清华大学玉泉医院
Yuquan Hospital of Tsinghua University



郑州大学第三附属医院
河南省妇幼保健院

Executive Team & Chief Scientists

Executive team



Suber Cui CEO

- M.A., School of Medicine, Tsinghua University
- Research Area : Machine learning , Time series signal analysis
- Research leader in celebrated startups (Caiyun AI & DeeplyCurious)



Ding Ma COO

- Ph.D., Dept. of EE, Tsinghua University, National Scholarship
- Star performance in Tencent MA、CITICS MA and BCG , excelled at financing and strategic planning



Kunjin Chen VP (algorithm research)

- Ph.D., Dept. of EE, Tsinghua University
- Research Area : Deep learning
- Several papers published on top academic journals (SCI &EI)



Xuetao Xing VP (data analysis)

- Ph.D., Dept. of EE, Tsinghua University
- **Gaokao Champion of Shanxi Province**, National Scholarship , Candidate of top performance scholarship
- Research Area : data mining , optimization , OR
- Several papers published on top academic journals (SCI &EI)

Chief Scientist



Bo Hong Chief Scientist(neurology)

- Ph.D., Professor, School of Medicine, Tsinghua University
- Research area : Authority expert in brain-computer interface , neurology and cognitive science; several papers published on top conference and journal including Nature & PNAS



Sen Song Chief Scientist (AI)

- Ph.D., PI, School of Medicine, Tsinghua University
- Research area : cross-disciplinary between AI and computational neuroscience ; several papers published on top conference and journal including NIPS

“

NAVIGATE INTELLIGENT HEALTHCARE





THANKS

Suber Cui | 188-1031-0071
cht15@mails.tsinghua.edu.cn

