An Expert AI System for Professional Neurological Patients Care

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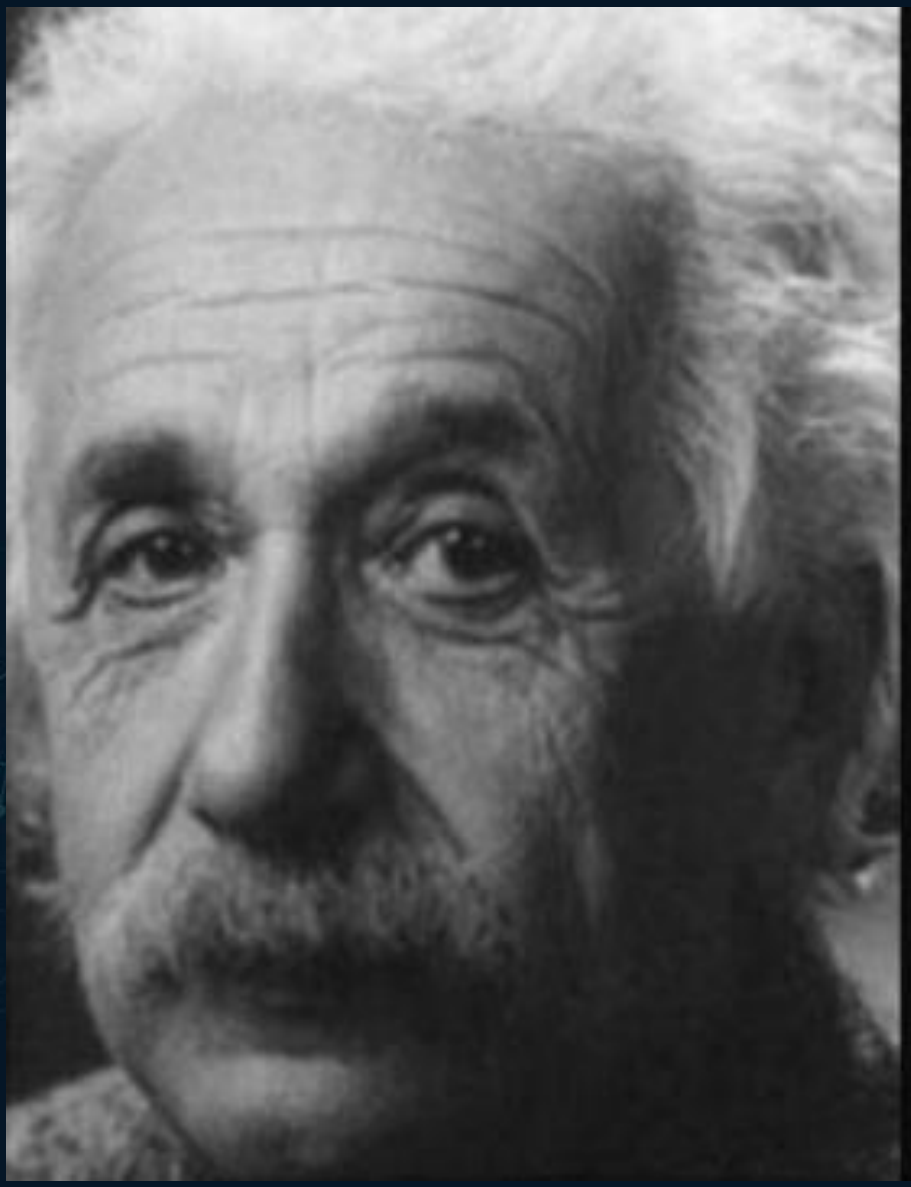

Computers are incredibly fast, accurate, and stupid: humans are incredibly slow, inaccurate and brilliant; together they are powerful beyond imagination.

— Albert Einstein —

AZ QUOTES

7 Future Technologies that are Trending in 2018

AR

IoT

Artificial Intelligence

Gamification

VR

Big data

BlockChain

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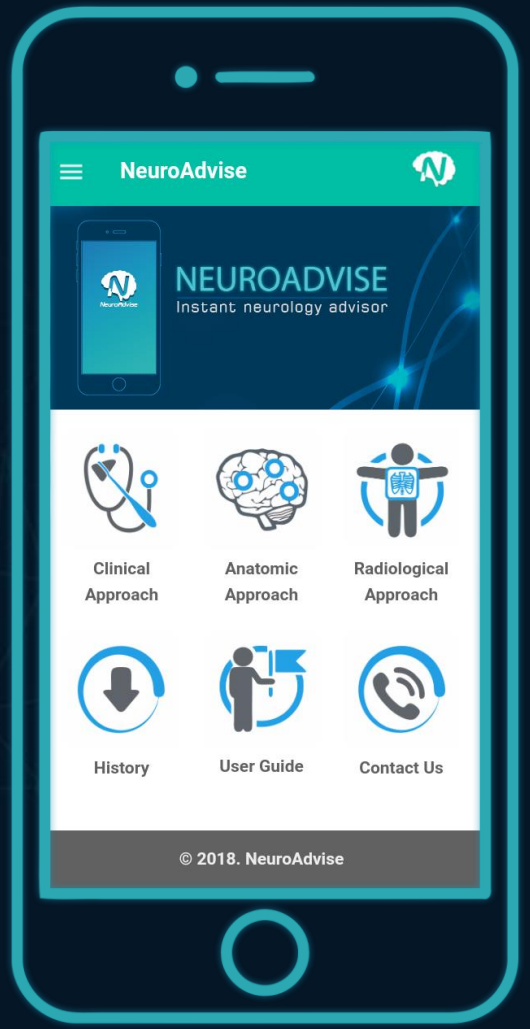
Sub-fields of AI

- Neural Networks e.g. brain modelling, time series prediction, classification
- Evolutionary Computation e.g. genetic algorithms, genetic programming
- Vision e.g. object recognition, image understanding
- Robotics e.g. intelligent control, autonomous exploration
- Expert Systems e.g. decision support systems, teaching systems
- Speech Processing e.g. speech recognition and production
- Natural Language Processing e.g. machine translation
- Planning e.g. scheduling, game playing
- Machine Learning e.g. decision tree learning, version space learning



NeuroAdvise

An expert system as a clinical decision support tool, for professional neurological practice

Problems

- Doctors high work load, low time to study, and unwillingness to consult
- False or delayed diagnosis
- Misuse of diagnostic tests
- Wrong or delayed treatment
- Absence of widely-accessible clinical databases
- Poor medical documentation
- Patient morbidity and mortality
- High healthcare costs

Continuing Education

Early Diagnosis

Accurate Management

Precise Documentation

Widespread Availability

NeuroAdvise

NeuroAdvise, A Single Solution for Multiple Health Problems

Available on the App Store

Available on Google Play

NeuroAdvise

Improve Your

Neurological Diagnostic Skills

Overview

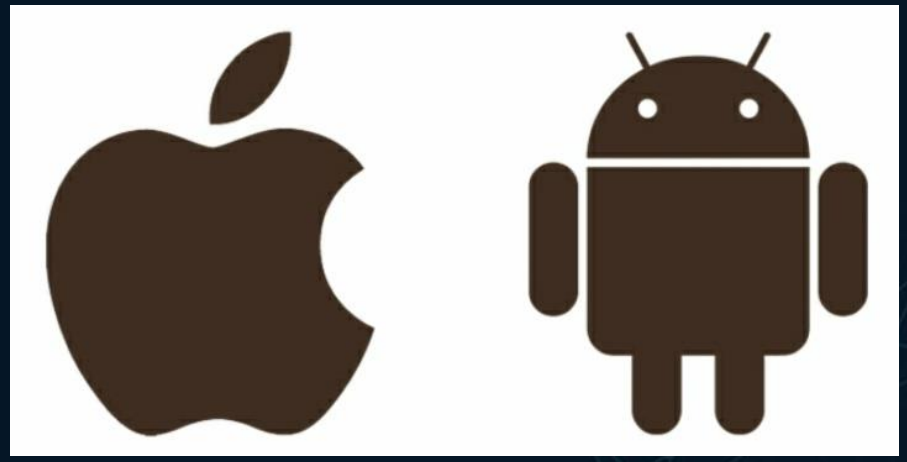
- I began to work on NeuroAdvise idea since 2011 with data collection from hundreds of resources (first with the aim of publishing a book)
- I began to cooperate with a team of IT experts since 2016
- They helped me convert my idea to several expert system algorithms and organize the database
- They helped me to organize this pathway:

Symptom → Lesion → Approach → Disorders → Investigations

- I began to cooperate with a team of medical students Since 2018
- They helped me extract data from databases and enter them into excel tables

Overview

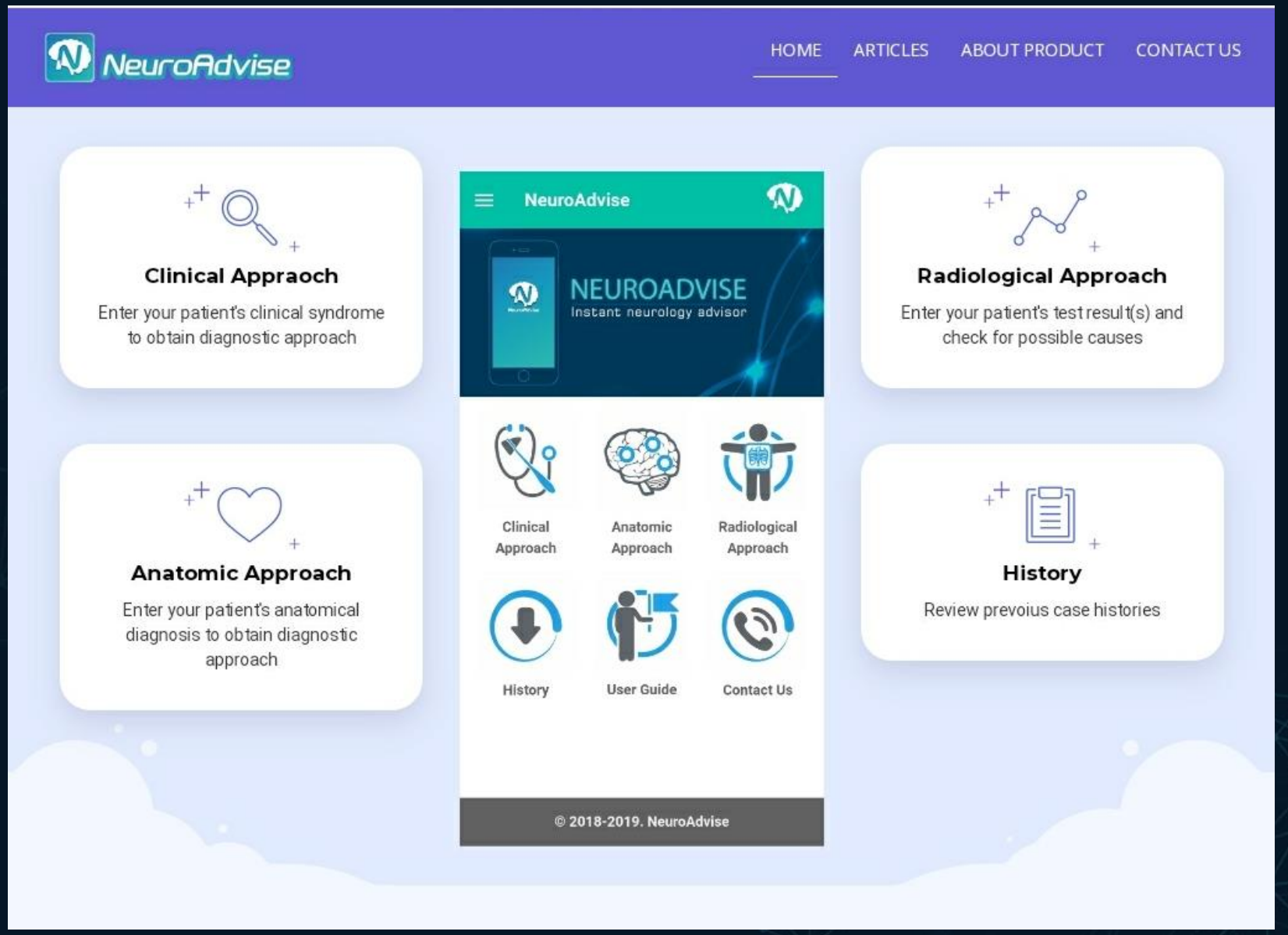
- We have published android version of NeuroAdvise at September 2018 on Google Play
- iOS version has been published at May 2019 on App Store
- Both versions are Published from Hungary and are available for free
- System debugging and improvement is currently under progress



Overview

- Users are medical doctors involved in neurology patient's care; including neurologists, neurosurgeons, psychiatrists, pediatric neurologists and all other medical doctors or medical students
- Radiologists and neuroradiologists are potential users
- Current edition is not suitable for patient's

Overview


NeuroAdvise
HOME
ARTICLES
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Clinical Appraoch
Enter your patient's clinical syndrome to obtain diagnostic approach
Anatomic Approach
Enter your patient's anatomical diagnosis to obtain diagnostic approach
NeuroAdvise
NEUROADVISE
Instant neurology advisor
Clinical Approach
Anatomic Approach
Radiological Approach
History
User Guide
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Radiological Approach
Enter your patient's test result(s) and check for possible causes
History
Review prevoius case histories

Clinical Approach

- This feature helps you perform a goal-directed neurological examination.
- Based on your entered data, the system will provide anatomical localization, a list of differential diagnosis (in order of probability) and a list of diagnostic investigations (in order of priority).
- If your patient has many problems, you can enter all of them and search for a common explanation.

Clinical Approach

Clinical Approach

Search

Note: You can search or select an item

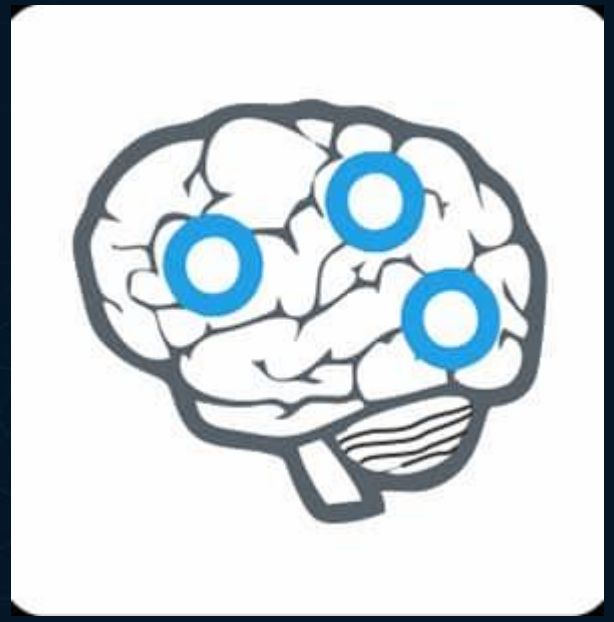
- Impaired consciousness
- Sleep-wake system dysfunction
- Neuropsychic impairment
- Visual system dysfunction
- Auditory system dysfunction
- Vestibular system dysfunction
- Olfactory system dysfunction
- Gustatory system dysfunction
- Somatosensory system dysfunction

Next

Anatomic Approach

- This feature is useful when you know the exact location of lesion within the given patient’s neuraxis, either based on clinical or paraclinical ground.
- Based on your entered data, the system provides a list of differential diagnosis (in order of probability) and a list of diagnostic investigations (in order of priority).
- If your patient has multiple lesions, you can enter all of them and search for a common explanation.

Anatomic Approach



Anatomic Approach

Search

Note: You can search or select an item

- Cerebral hemispheres
- Diencephalon
- Brainstem
- Cerebellum
- Cranial nerves and skull base
- Spinal cord
- Spinal nerves, roots and ganglia
- Plexus
- Peripheral nerves

Next

Radiological Approach

- This feature provides a list of differential diagnosis for common neuro-radiologic abnormalities.
- Based on your entered data, the system will provide a list of differential diagnosis (in order of probability) for that test results.
- If your patient has multiple abnormal test results, you can enter all of them and search for a common explanation.

Radiological Approach

Radiological Approach

Note: You can select one or more items

- [ ] Contrast-enhanced brain CT
- [ ] Contrast-enhanced brain MRI
- [ ] Contrast-enhanced spine MRI
- [ ] Conventional brain CT scan
- [ ] Conventional brain MRI
- [ ] Conventional spine MRI
- [ ] Diffusion-weighted brain MRI

Next

Overview

- The user must be online during working with the app
- Questions are automatically generated by the system and are asked from the user (passed through multiple filters). Any answer is directed to the server and analyzed. The next step completely depends on the previous step.
- If answers are incomplete, system directly asks some limited possibilities from the user and then proceeds.

Overview

Based on the following items, the system computes an index for each possible underlying disorder:

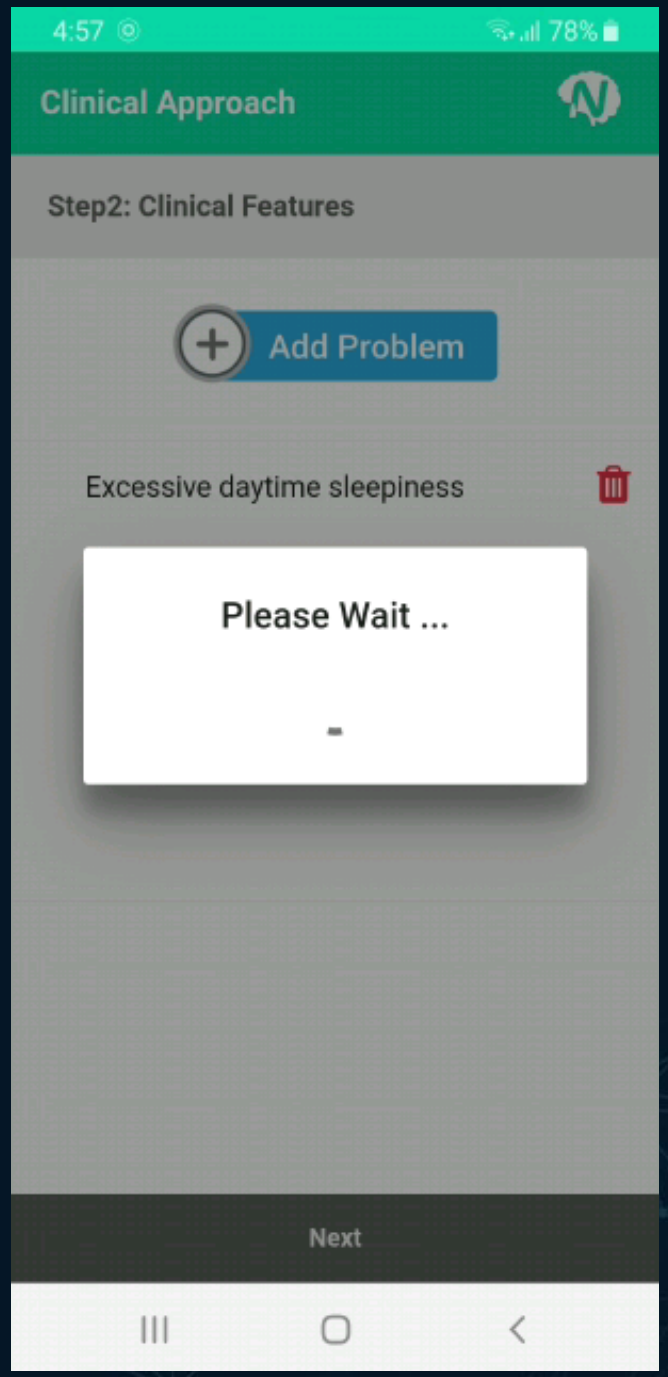
- Patient's demographics (age, gender, geographic location)
- Main clinical syndrome
- Prevalence of each clinical syndrome in any suggested disorder
- Anatomical lesion location
- Temporal profile
- Past medical history
- Drug history
- Exposure to toxins or trauma
- Family history

Overview

- Final list of disorders is classified based on pathophysiologic groups and is sorted in order of probability
- Top three causes are seperated
- The system also recommends some diagnostic tests in order of priority
- The result can be saved for later review and can be shared in all social media networks

Overview

Sample case: An old-aged man with excessive daytime sleepiness with past history of hypothyroidism



Achievements

- A comprehensive database, currently covering more than 3000 disorders, 1400 drugs, 1500 clinical features, 600 anatomic locations and 263 different approaches (numbers are growing)
- Innovative algorithms that are simulations of clinician's mental diagnostic process (NeuroAdvise is pioneer from this point of view)
- Helping our users reach from symptoms to causes and make better clinical decisions with several user-friendly features
- Helping our users localize the lesion within nervous system

Achievements

- Very fast data processing (within few seconds)
- Ability to store and share clinical data with other doctors
- Unlimited capacity for growth with an easy and fast update process
- Improving neurology patients care through improving doctor’s clinical skills


11:58 AM
NeuroAdvise
NEUROADVISE
Instant neurology advisor
Clinical Approach
Anatomic Approach
Paraclinical Approach
History
User Guide
Contact Us
© 2018. NeuroAdvise

Achievements

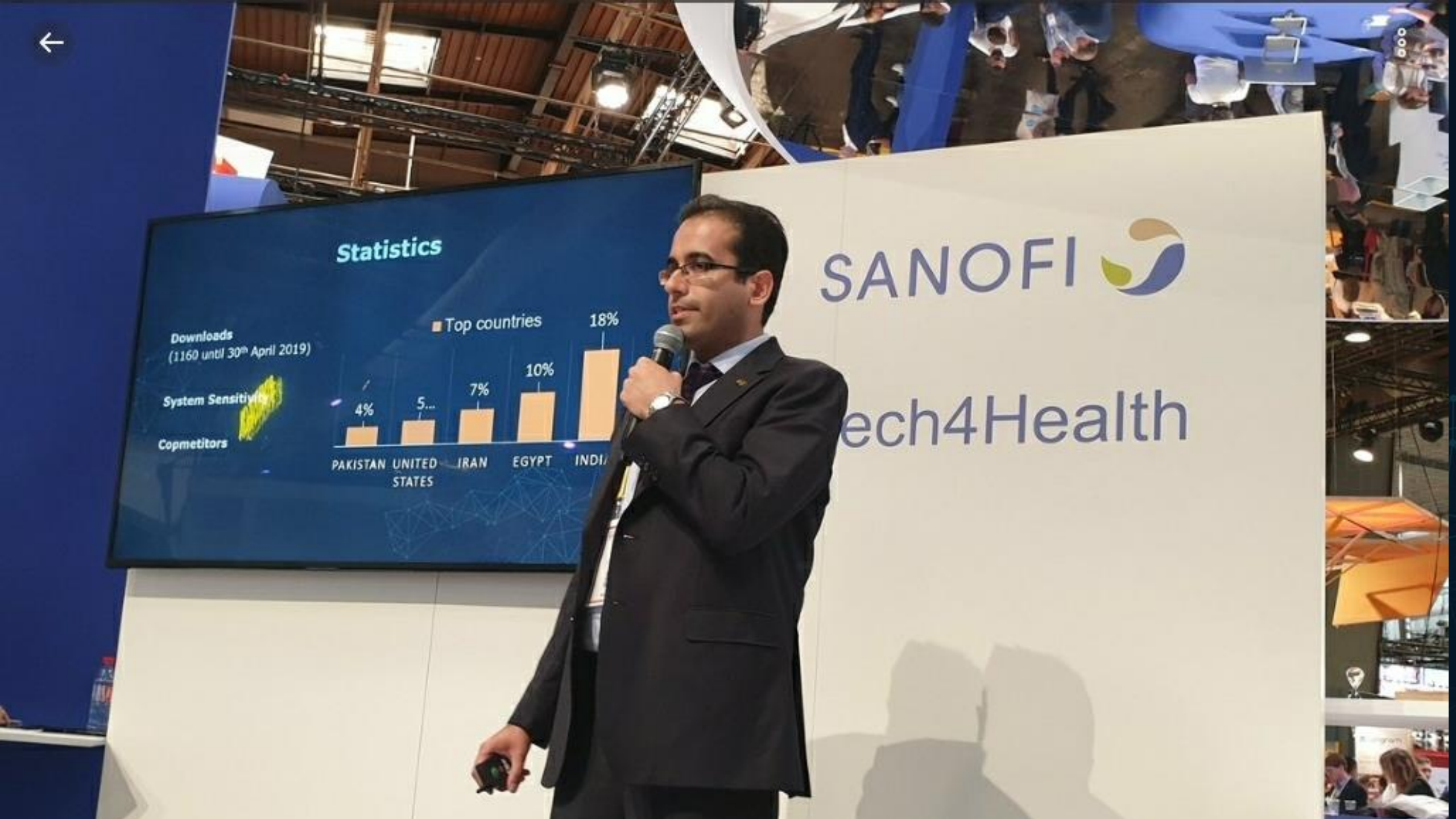
- We have 2040 downloads (until 20th August 2019) for android version, with about 50% active users
- Users are mainly from India, Egypt, Iran, United states, Brazil, Pakistan and France.
- User‘s population are growing gradually and we are trying to accelerate the process.
- Users mainly see us via our website and social media networks

Achievements

- We have been invited and participated in VivaTech 2019 event in Paris at May 2019, as the only start up from Iran.

124,000 visitors from 125 countries
13,000 startups
3,300 investors
2,500 journalists
450 international speakers, the latest tech innovations
Among 4000 start ups submitted their project to Sanofi, only 21 teams were selected and participated in Sanofi's Tech4Health Lab

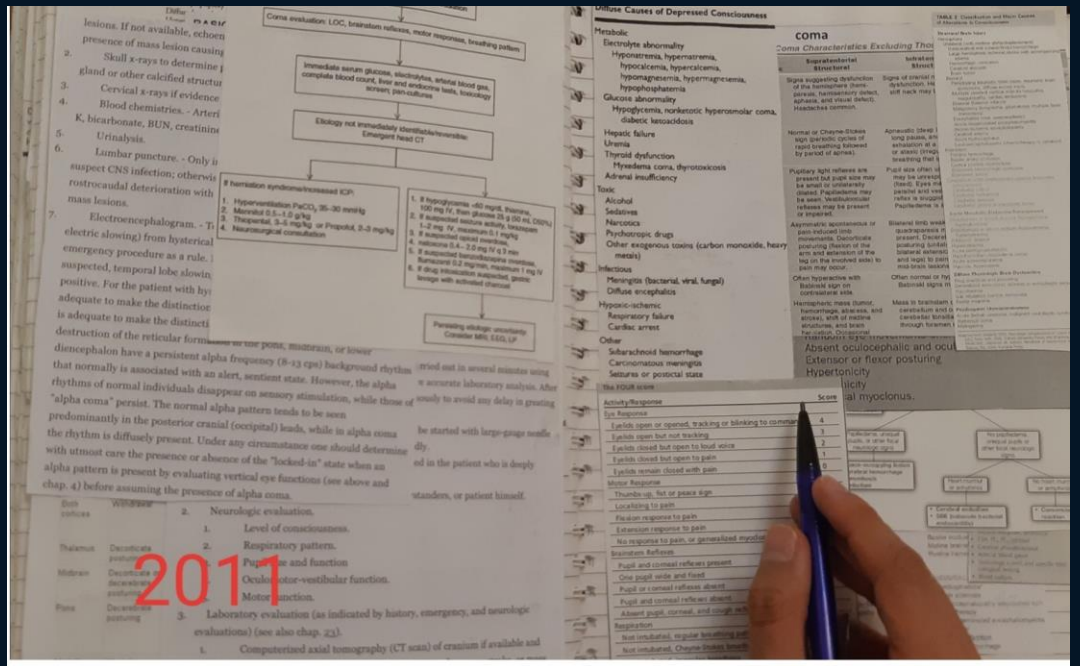

NeuroAdvise
GROWTH & SCALE
IRAN, ISLAMIC REPUBLIC
NeuroAdvise is a neurological diagnostic tool, available as a mobile application. NeuroAdvise helps in making clinical decisions and archiving patients related data. It is a smart clinical consultant and a potential resource for healthcare big data.
LOOKING FOR
www.neuroadvise.com
aws
hp

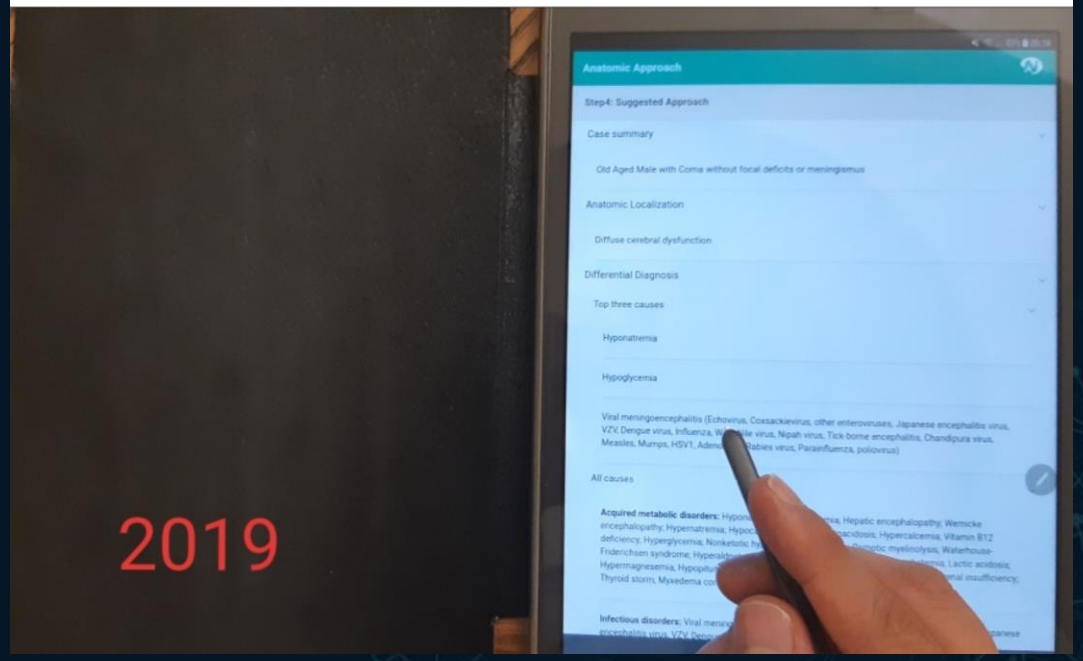

Statistics
Downloads
(1160 until 30th April 2019)
System Sensitivity
Copmetitors
Top countries
18%
10%
7%
4%
5...
PAKISTAN
UNITED STATES
IRAN
EGYPT
INDI
SANOFI
ech4Health

Achievements

- We have conducted a pilot study for system's diagnostic sensitivity with amazing results:
- More than 95% sensitivity for the diagnosis of acute ischemic stroke as the first cause
- 100% sensitivity for the diagnosis of acute ischemic stroke within top three cause
- A larger study is under progress

Challenges

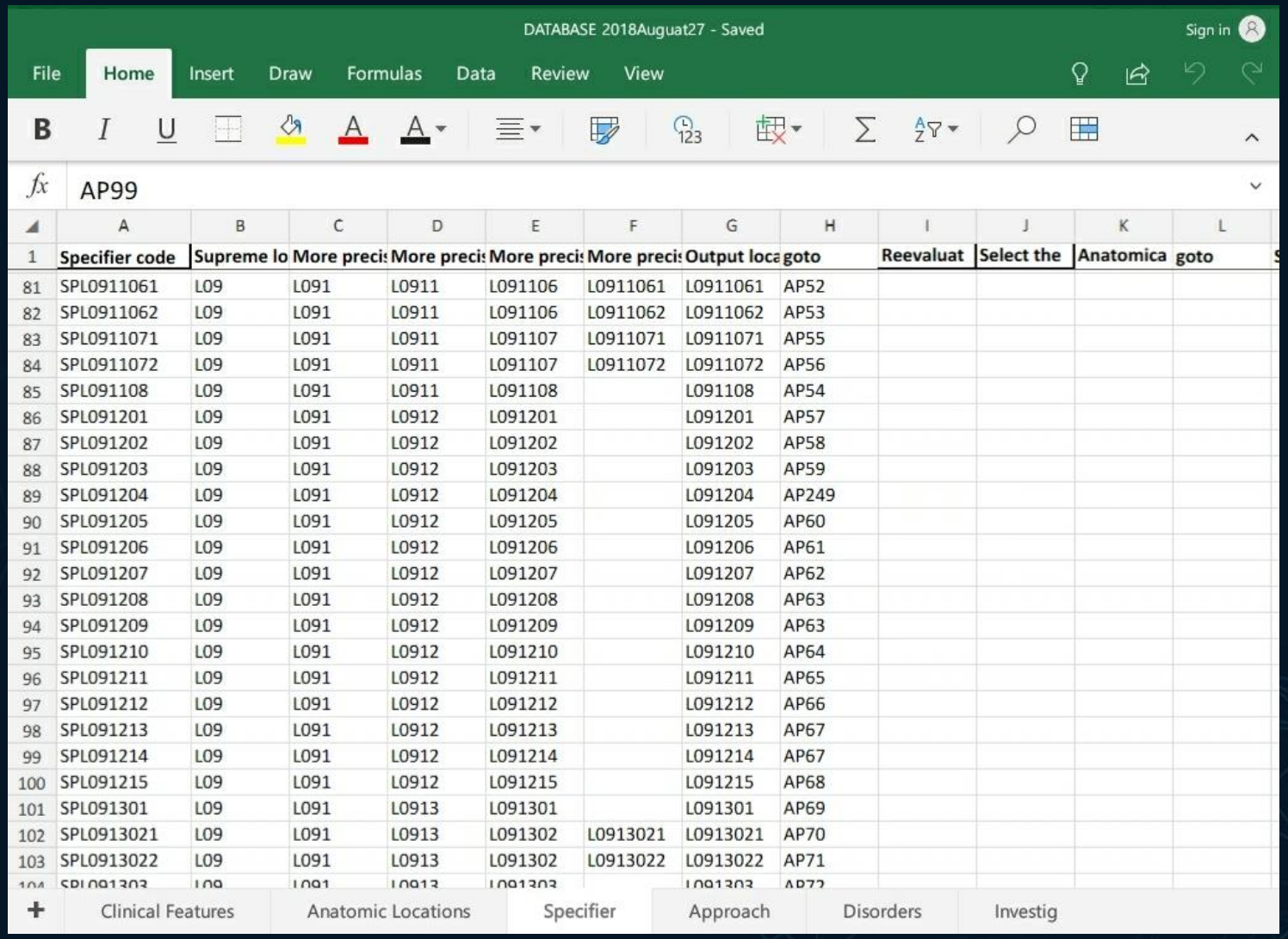

2011


2019
Anatomic Approach
Step4: Suggested Approach
Case summary
Old Aged Male with Coma without focal deficits or meningismus
Anatomic Localization
Diffuse cerebral dysfunction
Differential Diagnosis
Top three causes
Hyponatremia
Hypoglycemia
All causes

Challenge 1: Sanctions & Filtering

1. We are not able to have Google or Apple developer account
2. We cannot transfer our money (income or investment)
3. We have not access to some software developing tools
4. We have not access to analytic tools
5. We cannot condcut a complete product test from inside of our country, for example we cannot test in-app purchase capability
6. We cannot receive our users feedback and experience easily
7. Foreign investors and companies don’t accept the risk of working with Iranian people. We are isolated from global market making our business strategy quite difficult

Challenge 2: Unfamiliarity with data systems



DATABASE 2018Auguat27 - Saved

Sign in

File | Home | Insert | Draw | Formulas | Data | Review | View

AP99

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83	SPL0911071	L09	L091	L0911	L091107	L0911071	L0911071	AP55				
84	SPL0911072	L09	L091	L0911	L091107	L0911072	L0911072	AP56				
85	SPL091108	L09	L091	L0911	L091108		L091108	AP54				
86	SPL091201	L09	L091	L0912	L091201		L091201	AP57				
87	SPL091202	L09	L091	L0912	L091202		L091202	AP58				
88	SPL091203	L09	L091	L0912	L091203		L091203	AP59				
89	SPL091204	L09	L091	L0912	L091204		L091204	AP249				
90	SPL091205	L09	L091	L0912	L091205		L091205	AP60				
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96	SPL091211	L09	L091	L0912	L091211		L091211	AP65				
97	SPL091212	L09	L091	L0912	L091212		L091212	AP66				
98	SPL091213	L09	L091	L0912	L091213		L091213	AP67				
99	SPL091214	L09	L091	L0912	L091214		L091214	AP67				
100	SPL091215	L09	L091	L0912	L091215		L091215	AP68				
101	SPL091301	L09	L091	L0913	L091301		L091301	AP69				
102	SPL0913021	L09	L091	L0913	L091302	L0913021	L0913021	AP70				
103	SPL0913022	L09	L091	L0913	L091302	L0913022	L0913022	AP71				
104	SPL091303	L09	L091	L0913	L091303		L091303	AP72				

Clinical Features | Anatomic Locations | Specifier | Approach | Disorders | Investig

Challenge 2: Unfamiliarity with data systems

1. Doctors have medical knowledge but not data knowledge
2. IT experts can work with data but are not familiar with medical knowledge
3. Medical data specially medical advices are quite sophisticated and critical. Wrong advices can be life threatening to the patient.
4. Making such an interface between medical knowledge and computer is very difficult
5. Editing the database also needs attention, one wrong code can lead to a completely wrong output

Challenge 3: Limited financial resources

1. Our priorities differ from developed countries. We have focused on treatment and they have focused on future health problems
2. We have limited access and connection with global companies that can fund in such a project
3. We have limited connections with medical publishers and universities

Challenge 4: Limited human resources

1. AI projects are team work
2. To have an expert team we need money, motivation and time
3. This is more important if we want to develop a comprehensive medical decision support system. We will need more scientific editor’s and data collecting and organizing people

Current state & Future perspective

- Several effective features will be added to the current version to meet most of users' needs (Current system consists 30% of the final NeuroAdvise product)
- Textual information and media will be added

Current state & Future perspective

- NeuroAdvise can be expanded to all other medical fields and I have named the final product MedEx24, that is a comprehensive clinical database for all healthcare professionals
- We can be a potential competitor for current medical databases such as uptodate, …
- New technologies such as VR and AR can be included

Business model

Selling subscriptions, individual or institutional

Accepting advertisement from drug companies

Promoting hospitals information systems

Collecting epidemiological data for WHO & healthcare systems

Market

- Total Market size for NeuroAdvise:
  - 500.000 medical doctors, mainly neurologists, neurosurgeons, psychiatrists, radiologists, general practitioners as well as medical students
  - 200 drug companies

- Total market size for MedEx24 (the final comprehensive product):
  - 14.000.000 medical doctors in all degrees and specialties
  - 10.000 university and institution
  - 2.000 drug and instrument companies
  - 20.000 hospitals

Market

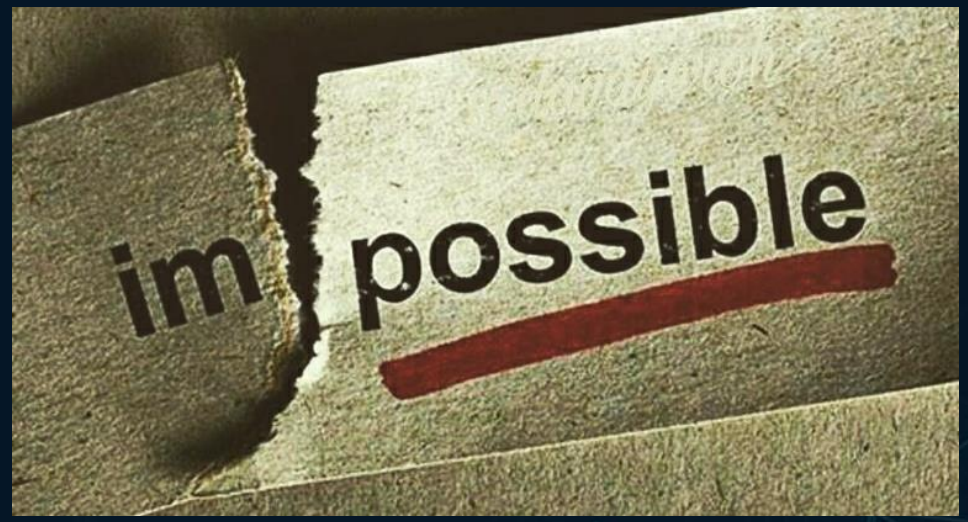
- “The easiest way to get one million people paying is to get one billion people using.”

  Phil Libin, Evernote

"Your time is limited, so don't waste it living someone else's life. Don't be trapped by dogma - which is living with the results of other people's thinking. Don't let the noise of others' opinions drown out your own inner voice. And most important, have the courage to follow your heart and intuition."

- Steve Jobs

NeuroAdvise will proceed stronger ....



https://www.neuroadvise.com