Chronic diseases and machine learning

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Presentation outline

- Definition of machine learning
- Parkinson’s disease
- Diabetes
- Hashimoto’s disease
- Conclusion
Definition

“Machine learning is the subfield of computer science that gives computers the ability to learn without being explicitly programmed”

–Arthur Samuel

“A computer program is said to learn from experience E with respect to some class of tasks T and performance measure P if its performance at tasks in T, as measured by P, improves with experience E.”

–Tom M. Mitchell
Where to fit Machine Learning in exactly?

whatsthebigdata.com
## Parkinson’s Disease

### What is Parkinson’s disease?
- Long-term degenerate disorder of the central nervous system
- Mainly affect the motor system

### What causes Parkinson’s?
- Causes are unknown, but involves...
  - genetics
  - environmental factors
Who are afflicted?

- 53 million people (2013)
- About 103,000 deaths
- Typically people over the age of 60
Parkinson’s Disease

What symptoms?

- Motor symptoms: Shaking, rigidity, slowness, difficult to walk
- Thinking and behavioural problems
- Dementia
- Depression and anxiety
Users start the app and put their phone in their pocket. Users proceed to walk for 20 yards in a straight line and back. A smartphone accelerometer records their walking pattern.
Parkinson’s Disease

What treatments?

- No cure
- Antiparkinson medication
Diabetes: why the interest from Google?
What is diabetes?

- Broken insulin production and blood sugar regulation
- Too high blood sugar damages blood vessels
- Too low blood sugar is an acute danger
Managing diabetes: the challenge
Managing diabetes: the goal

![Graph showing blood glucose and serum insulin levels. The graph highlights different food types and their impact on blood glucose and insulin levels.](image-url)
Diabetes: the machine learning potential

Google Im2Calories

Blood glucose level

Machine learning app

Insulin dose recommendation

More data: exercise tracking? google maps? etc
Hashimoto’s disease: what is it?

- An autoimmune disease which gradually destroys the thyroid gland
- It’s hard to diagnose in its early stages
- Can lead to hypothyroidism
Hashimoto’s disease: signs, symptoms diagnosis

- The usual... fatigue, pale faced, feeling cold... not so specific symptoms
- At a later stage the thyroid can become firm, large and unpalpable
- Disease can be diagnosed by measuring certain types of antibodies
Hashimoto’s disease: statistics

- Affects about 5% of global population
- Seven times more common in women than men
- More common in middle aged people
Hashimoto’s disease: diagnose with machine learning

- 250 ultrasound images of people suffering from disease, 250 images of healthy people
- 10 attributes per image
- Classified if unhealthy or healthy using SVM
- Result: Large data set = good result, small data set = bad result
Conclusion: Machine learning has different roles

- Parkinson’s: ML is used in diagnostics and hand tremor equipment
- Diabetes: ML manages dosage regulation
- Hashimoto’s: ML acts as a diagnosing tool
Thanks for listening!
If the government allowed big companies (like Google) to access all medical journals for the purpose of developing big data algorithms, which detect and diagnose diseases earlier than today, would you be ok with this? If not, is there any way you would be ok with it?
Let’s imagine that Facebook hands out bracelets that monitor your health conditions for free. The bracelets could predict diseases. They would inform you if they believe you have a decease. The only trade-off would be that Facebook receives all your medical and health care information and stores it in connection to your Facebook account. Would you wear them? What objections would you have?
Suppose the government supplied you with such a bracelet that you wear throughout your life, monitoring your health. Deciding when you need to go to the doctor, if you’re fit for military service etc. Would you be ok with that? What objections would you have? How does this compare with the Facebook example?
Discussion questions

Do you think that we will, within our lifetime, be able to completely counteract the symptoms of diseases like parkinson’s, using machine learning? In what ways can machine learning be used to help people with parkinson’s disease in everyday life? How would you apply machine learning to diagnose and treat other diseases, like for example: HIV, Cancer, Common Cold, ALS, Alzheimer’s, Artrosis, sore feet?