Artificial Intelligence in Insurance and Actuarial Science

Three intuitive points

1. **Does insurance fall in love with AI?**
2. **Why is it New-Gen AI ?**
3. **Can AI really empower ……?**
4. **What's the future after empowering?**

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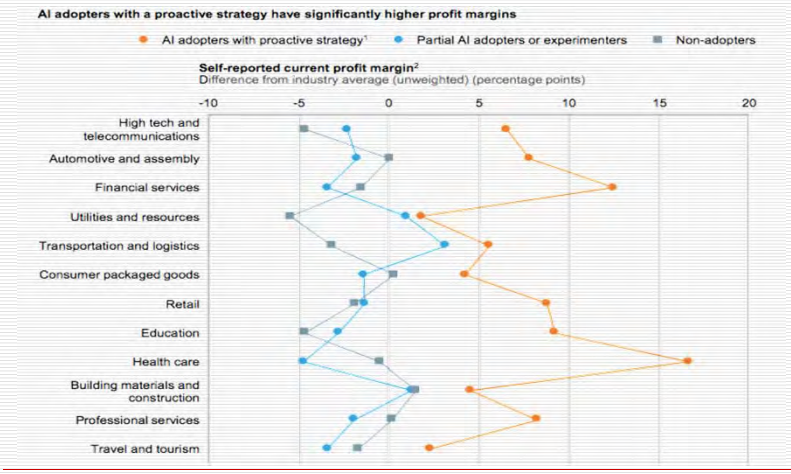
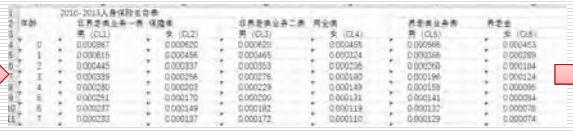
From McKinsey: AI adopter with proactive strategy have significantly highly profit margin



SOURCE: McKinsey Global Institute AI adoption and use survey; McKinsey Global Institute analysis

Compressing……

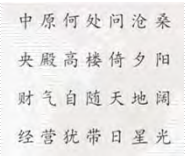
A large amount of data from many companies



Pricing
New insurance product

Many many Chinese Poems

Chinese Poem Knowledge
Rhythms,
Words,
Scenes and so on.



SOCIETY OF ACTUARIES → Photo Software → SOCIETY OF ACTUARIES

Can we get the target from original information directly without the intermediate products or tools?

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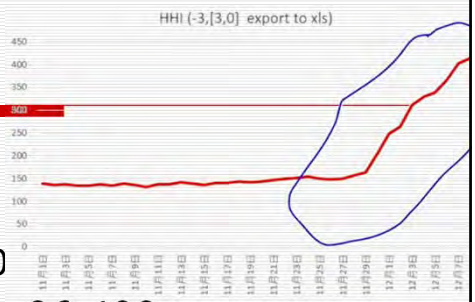
Big data



Every second:

- Users: 300,000
- Dimensions: 10,700
- Seconds (one day) : 86,400

For runner to find the optimal plan :

- Dimensions: 79 /kilometer/seconds
- Steps: 50~190 in 10 kilometers
- Paths: 3^50

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Outline

- **Does insurance fall in love with AI?**
- **Why is it *New-Gen* AI ?**
- **Can AI really *empower* ……? Cases&Examples**
- **What's *the future* after empowering?**

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AI's attitudes about Insur

So much data

Good IT infrastructure

We can help them promote the efficiency

Every one in Fin&Insur knows Much Mathematics

We need money

They have capital…..

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Insur's attitude about AI

- Superman
- Just another model like GLM
- Useless
- Hype for Venture Capital
- Loss of jobs

……..

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Just dating……Not falling in love

AI is taking more and more Non-core job (Fintech companies)

Ant Financial
Machine Loss Assessment
"定损宝"
Based on Deep Learning

There are barriers between Core techniques in insurance & finance and AI

Future

Will need different techniques
Will more efficient
Will be bi-polar mode in the future……

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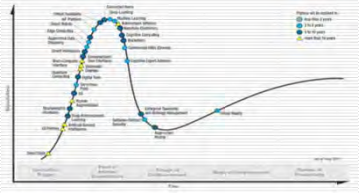
1 Economic Direction and Trend

- Quantifying direction
- data-producing and data-driving
- Information digitized
- Trend of Long Tail



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Exponential growth of data volume

2. Data's Direction

- Volume
- Variety
- Velocity
- Veracity
- Value

Google

Googol

- Now, Process 200, 000PB data, Google, One day
- Now, Upload 20TB photos, Taobao, One day
- Now, capture 1,000TB, Facebook, one day
- Create 4TB data, driver-less care, 2020

T, P, E, Z, Y, D, N

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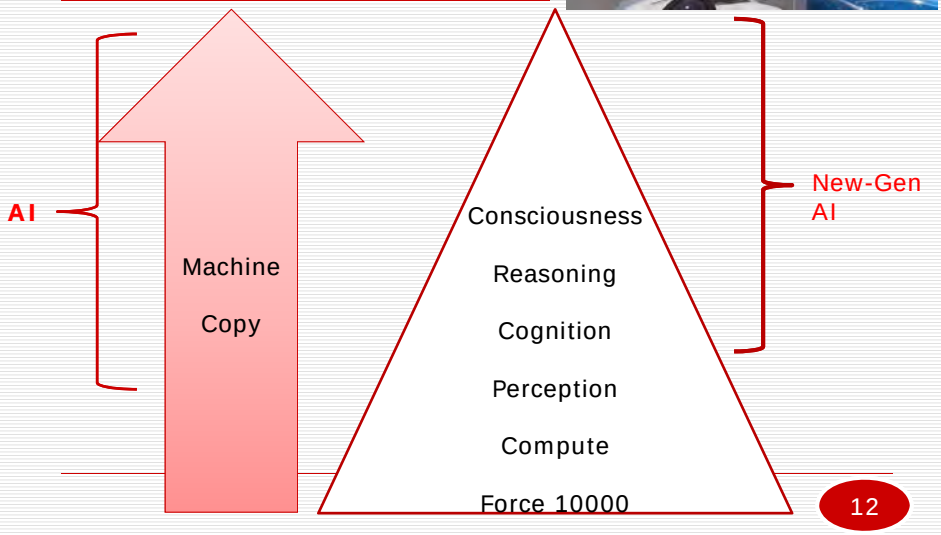
3. AI's Direction



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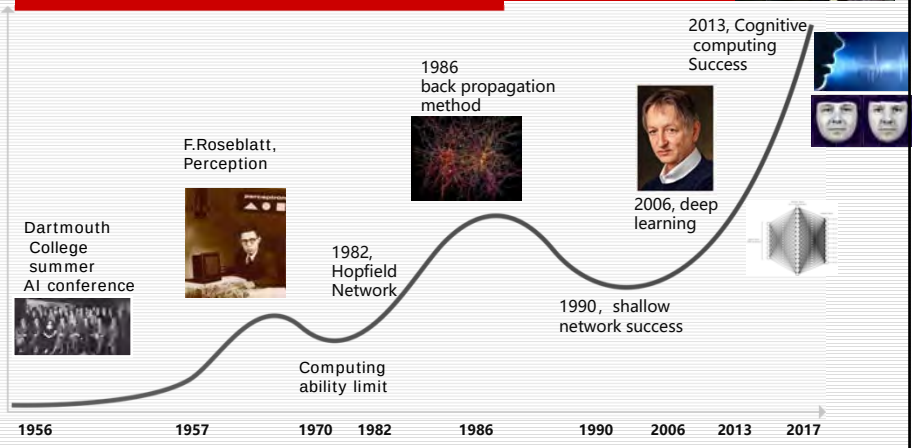
Ex1: Wavy development



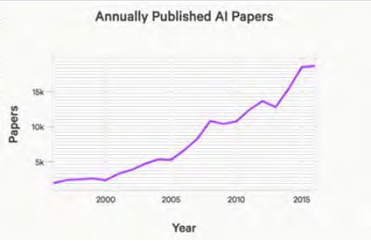
New Generation AI

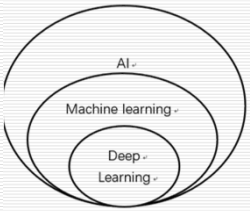
Ex2: AI Techniques /AI papers

- Machine learning
- Mapping Knowledge Domains
- NLP, NLU
- H-M interface, Brain-Machine connection
- New-Gen computer vision
- Biometrics

fingerprint, voice print, gait, Iris, face, bacteria flora….

- VR





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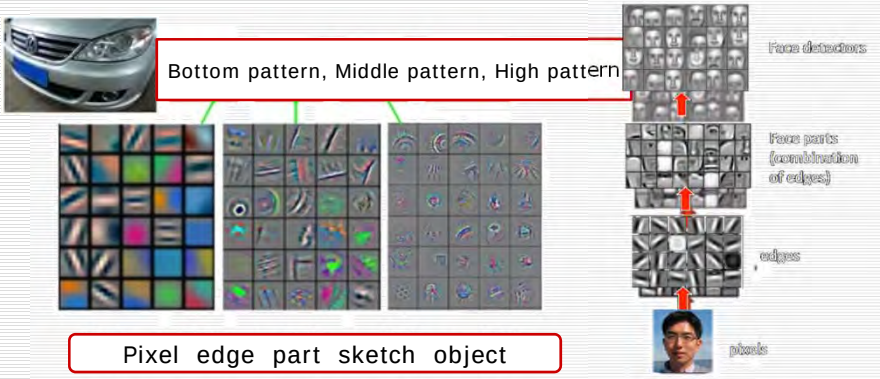
Ex3: Deep learning



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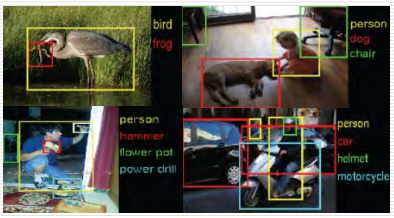
EX4: Image recognizing "read" photos like human



Surpass human	DeepID begin	6 digit password	8-digit password
98.52%	DeepID3 99.55%	1/1,000,000	1/100,000,000
人眼 97.45%	DeepID2 99.15%	95%	97%
97.35%	300,000	60,000,000	2,000,000,000
2014	2015	2016	2017

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4 Challenges for Insurance

- Data of Population
- Unstructured Data
- High-dimension Data
- Complex Correlation
- Many Unknown Characters
- Many hidden statuses
- High-order Information
- Large-scale Connection

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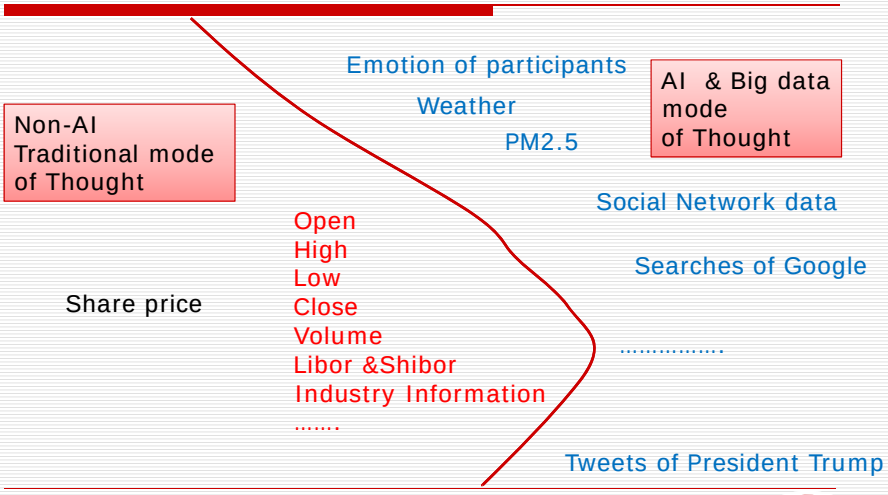
EX1：population



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EX2. Some facts 1 (insurance models)

- Linear Model and its derivative models will fail (especially in practice)
- we know little about its potential pattern
- "Compressing process" lose much useful information
- static models are not robust when facing the dynamic big data flow

Exponential growth of data volume

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Ex2: Some facts 2 (insurance companies)

- About structured data
- About relational Database (SQL)
- About Econometrics and Linear Model
- About Limited factors
- About data island & Knowledge island
- About Samples and Compressed directions
- About traditional computer capacity

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EX3. Some direct conflicts

- Internet Economics: Personalized requirement
  Insurance products based on general group & law of large numbers
- Data mining from Big data with high-dimension
  Actuarial models fitting for traditional datasets
- Unknown knowledge or pattern recognition
  hypothesis and test
- Merging almost knowledge & general deep mind
  Actuarial models & insurance knowledge
- Two hands : Computing capacity and capital
  Capital only

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Outline

- **Does insurance fall in love with AI?**
- **Why is it New-Gen AI ?**
- **Can AI really empower ……? Our research and practices**
- **What's the future after empowering?**

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1: Anti-Fraud

Traditional techniques

Many Factors

老年人	0.598	0.493	1.309
	(0.660)	(1.004)	(2.665)
职业分类	-0.137*	-0.0911	-0.263
	(0.0751)	(0.124)	(0.338)
婚姻情况	-0.230	-0.277	-1.578
	(0.191)	(0.316)	(1.252)
收入对数	0.0117	0.0217	-0.218
	(0.0855)	(0.143)	(0.469)
医院类型	0.0297	0.0143	-0.0225
	(0.0505)	(0.0800)	(0.17)

March 29, 2017 AXA, the large global insurance company, has used machine learning in a POC to optimize pricing by predicting "large-loss" traffic accidents with 78% accuracy.

Google Cloud, Tensorflow

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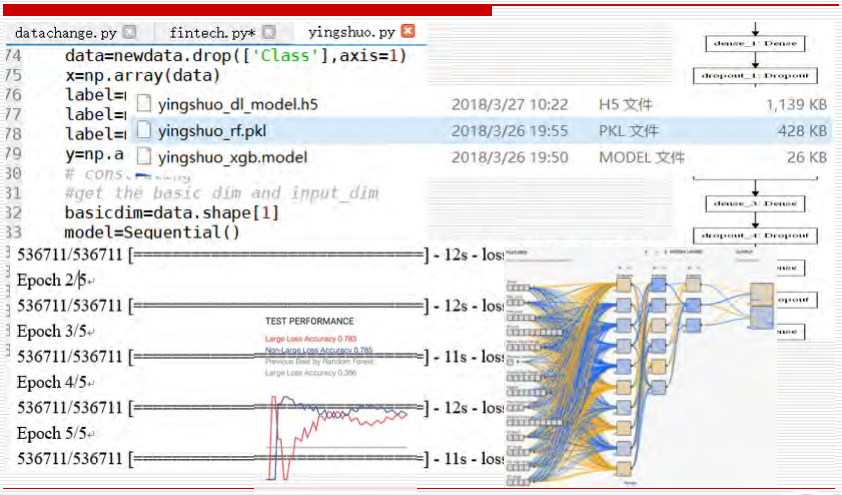
Our Deep Learning Framework for detecting fraud 1



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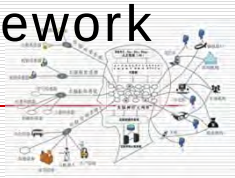
Our Deep Learning Framework for detecting fraud 2



- Framework: Reinforcement Learning
- Brain: Deep Learning / Machine learning
- Perception 1: Nature Language Processing & Understanding
- Perception 2: Photo / Video Recognizing (Understanding) (to find fraud information)
- Perception 3: Audio Print Recognizing (to find fraud information)
- Perception 4: Mapping Knowledge Domains (to find fraud gangs)
- Perception 5: Data Feed Back, Auto-ML techniques

Brain/DL/ ML

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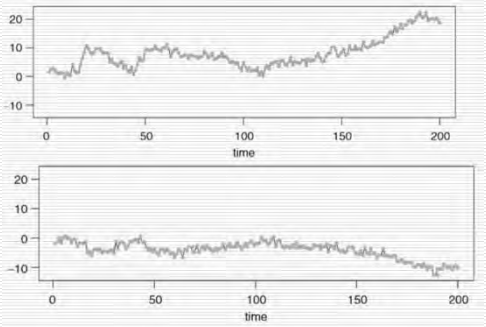
EX: "hearing ability"



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From anti-fraud to loss assessment

Driver license OCR

vehicle recognition

Auto-loss assessment

车牌：LAR000
VIN码：
LVJW000000000000

车型：华晨宝马5系
车牌：LAR000

Car door loss
Spray paint loss：800

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2: Pricing based on Biological age

- Health risk is different for the people with same calendar age.
- Individual pricing or dynamic pricing is the trend in the Network Economics.
- Consider the cost when Implementing individual pricing

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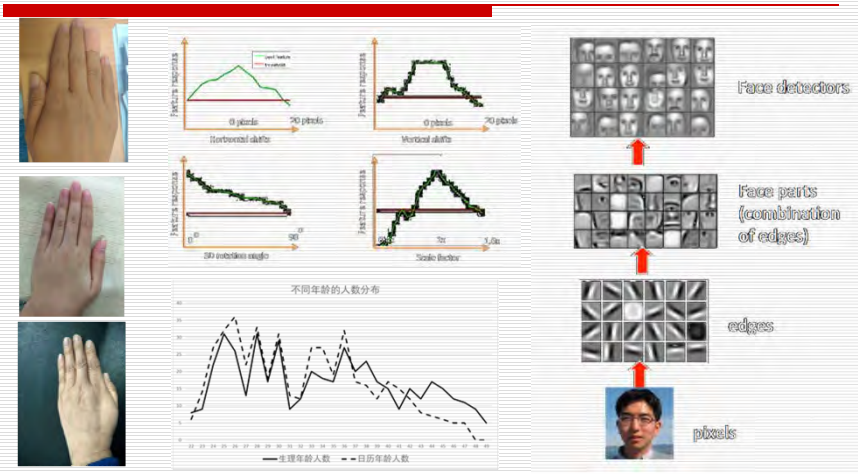

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Notes, evolving……

- From 9-layer CNN to Res-Net with 32 layers
- Transferring Learning from CA target to BA target
- Curvature pattern capture
- Check and work with the sports data (72 dimension)
- Forecast the future trend of BA
- Worked with medical data now

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3: (Insurance) Investment Finance Go

Human PK **Quantitative investment program (2015, Zhang&Lin)** PK **AI-Finance Brain Finance GO (2016,Zhang &Zhao)**

	Human	Quan-Invest	Finance Brain
Average return	8.9%	7.6%	16.3%
Risk-controlling ability	85	100	51
Times of Extreme Risk	6/10	0	3
Maximal Loss	-13.7%	-7.2%	-18.1%
Good term scale	Short , mediam	Short	medium, long
Over-all evaluation	80	60	100

Based on reinforcement learning Without any human Experience, 112 trading day's experience in market

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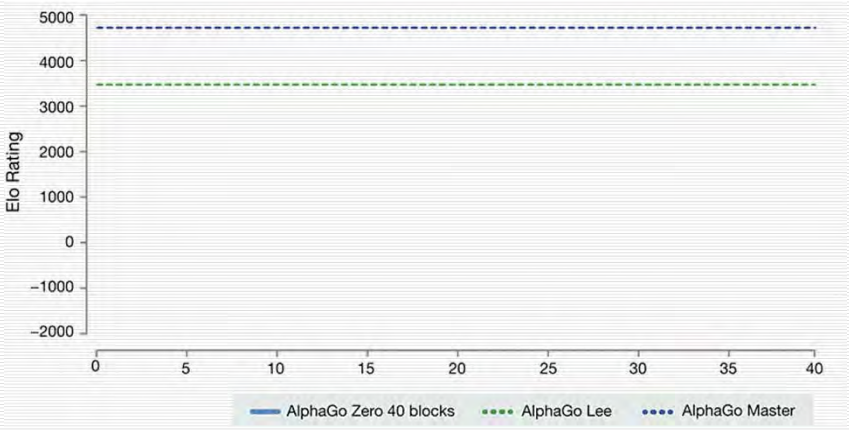
EX: Following "Evolution" of alpha Zero



Deep mind

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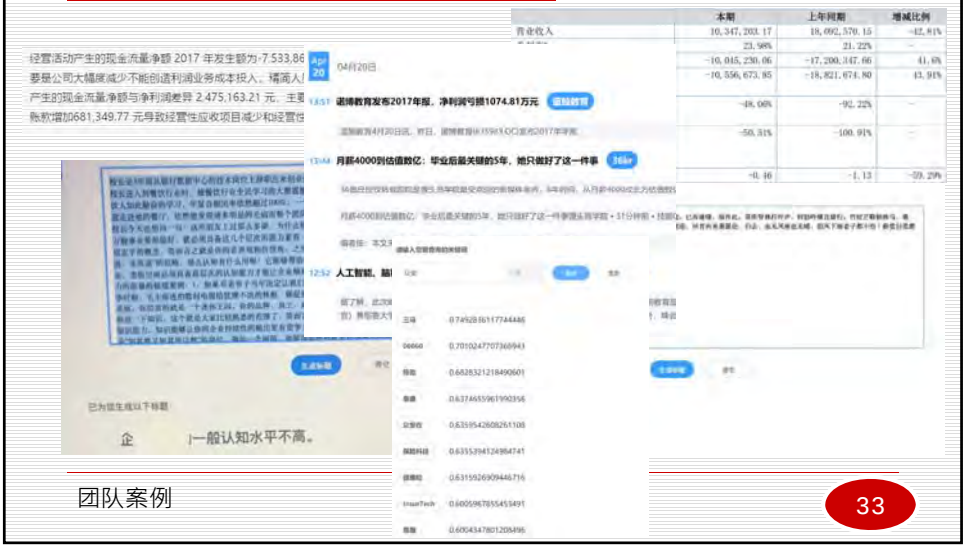
4：Finance AI-Platform：
understand the professional reports



团队案例

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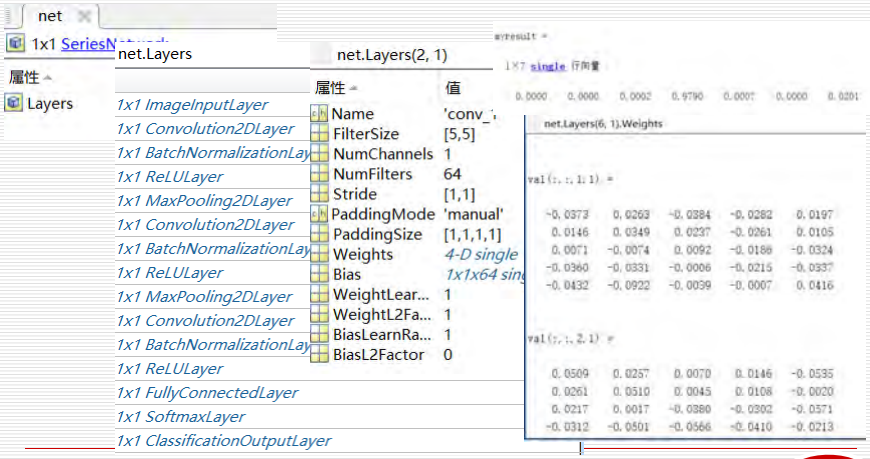
5： financial risk appetite



For mobile-GPU

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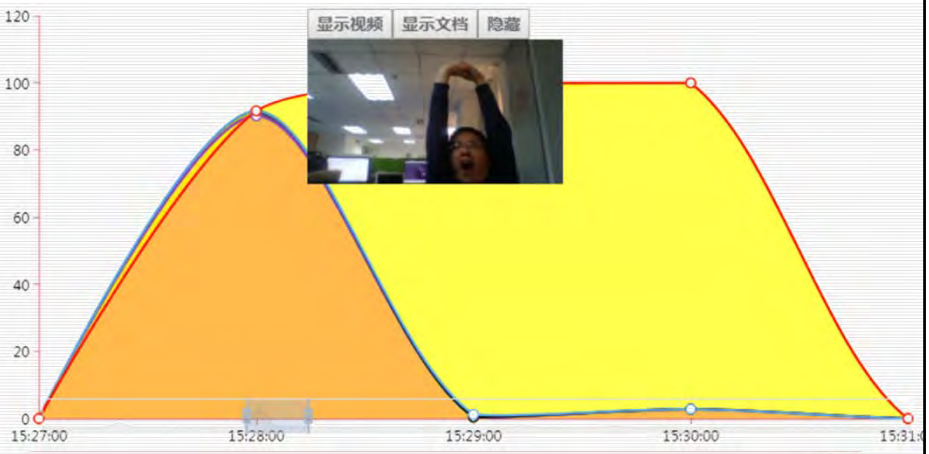
EX:
Risk appetite analyzing report



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EX:
Computing Power

Computing power

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Outline

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- What's the future after empowering?

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Just need to stride over 3 Barriers

1 paper, 5%

Black Box : The interpretability of the deep learning

Maybe : Information geometry,
Symbolic computation
Equation on graph
Geometric algebra

Financial Brain,20%

AI ability under uncertain scene or RL : Risk measurement and management

Auto Financial ML

General / Universal Financial Learning

AI Cell

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Thanks for your patience!

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