机器学习与量化交易实战

第一讲

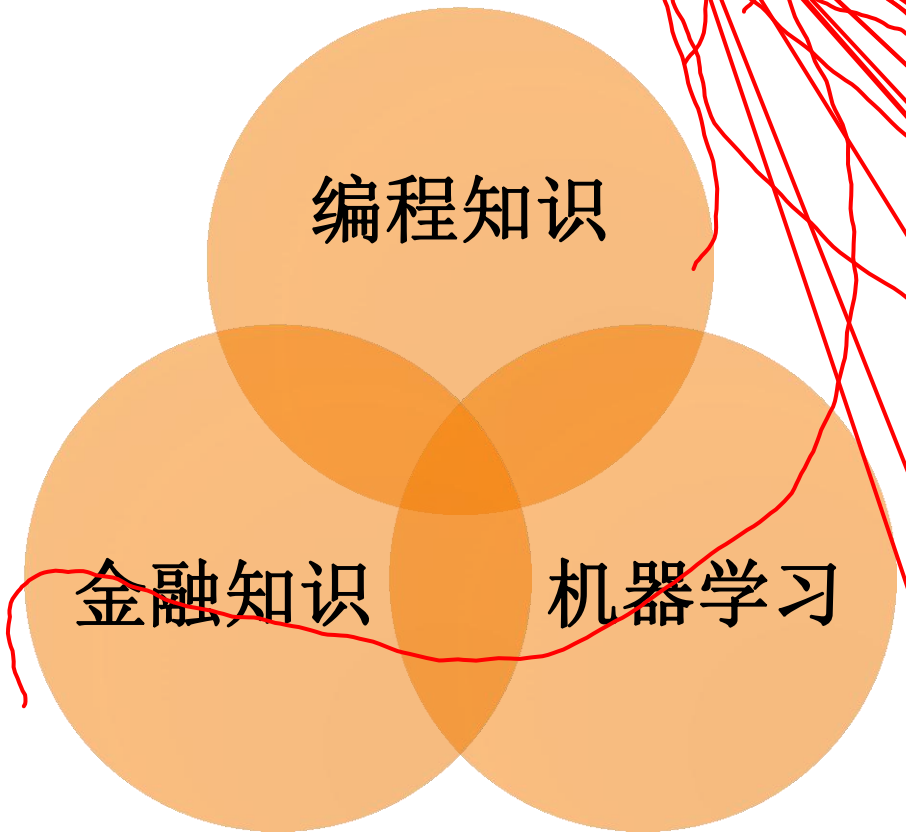
机器学习 量化交易 实战

1. 为什么要做算法交易
2. 交易系统的开发与设计
3. **时间序列分析**
4. **策略建模及其优化方法**
5. **策略评价与回测**
6. 风险管理
7. 交易策略的实现
8. 交易策略的执行

重点

This is a team work, but you need to know the big picture and see which role suits you.

The Big Picture
And How The Course Is Organized



Office Hours:

8-10 pm 周二 / 周四

Weekly Readings

Homework

Extra Projects For Motived Students.

算法交易综述

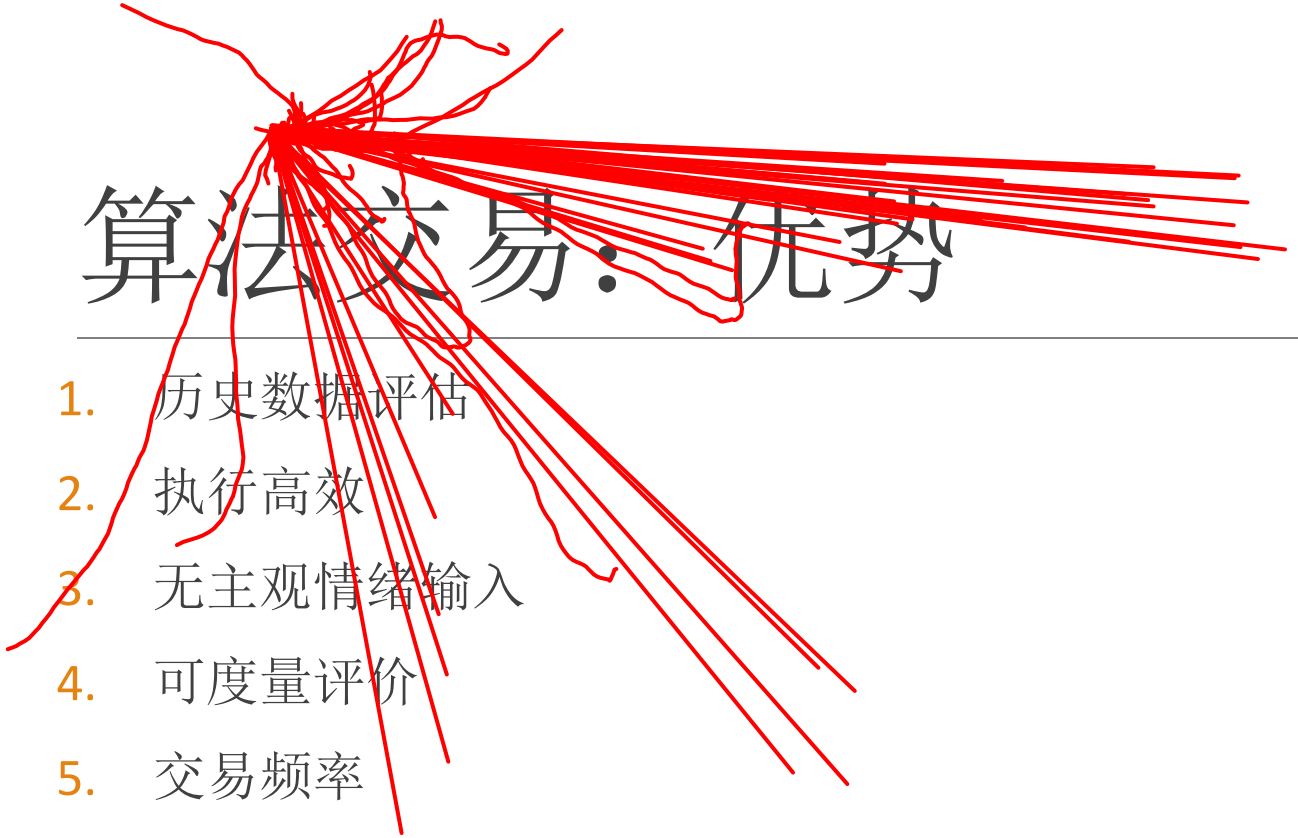
Algorithmic Trading Without Bullshit

何谓算法交易

Algorithm Trading

利用自动化平台，执行预先设置的一系列规则完成交易行为。

算法交易：优势



1. 历史数据评估
2. 执行高效
3. 无主观情绪输入
4. 可度量评价
5. 交易频率

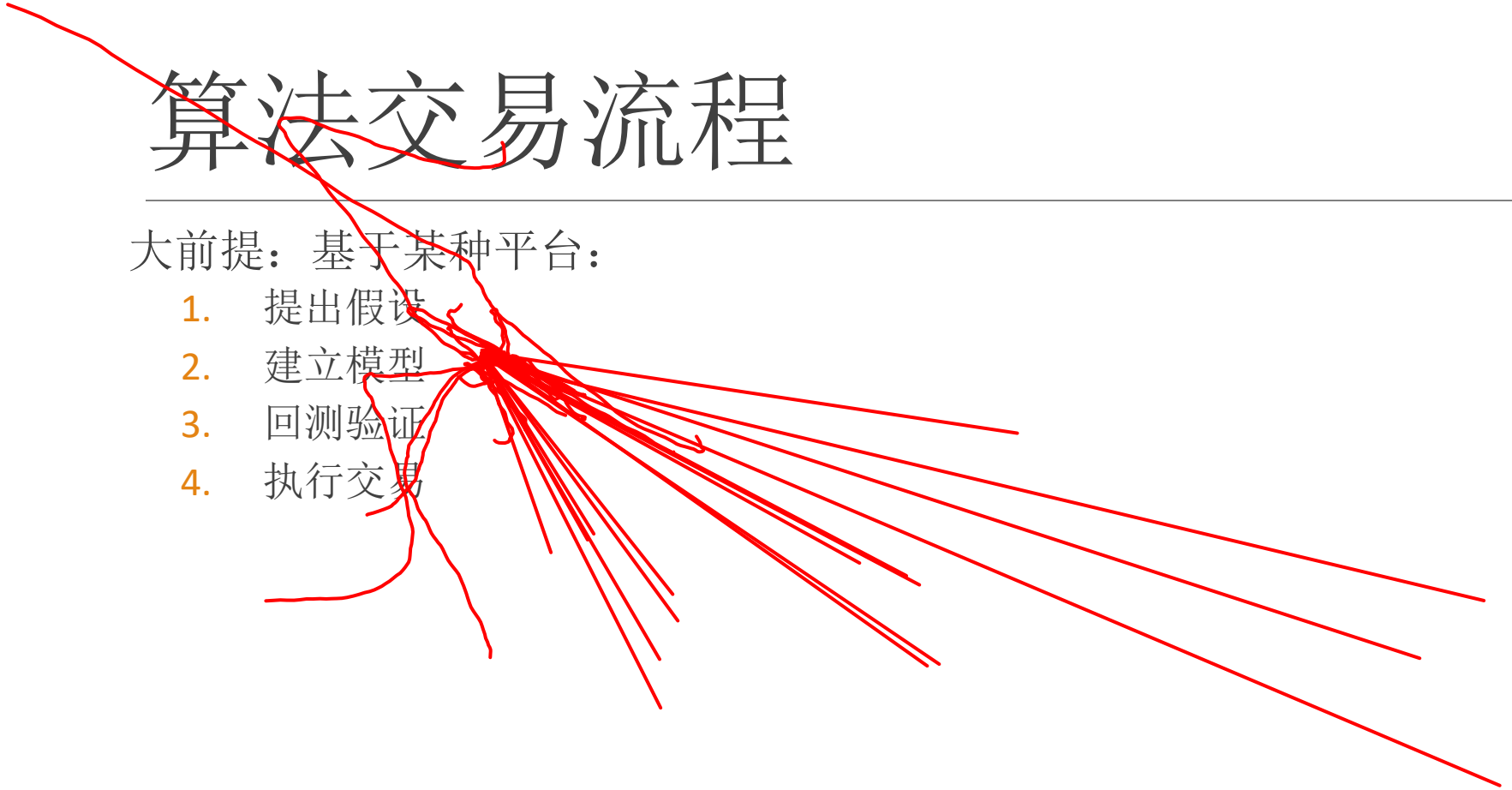
算法交易：劣势

1. 成本
2. 技巧

算法交易流程

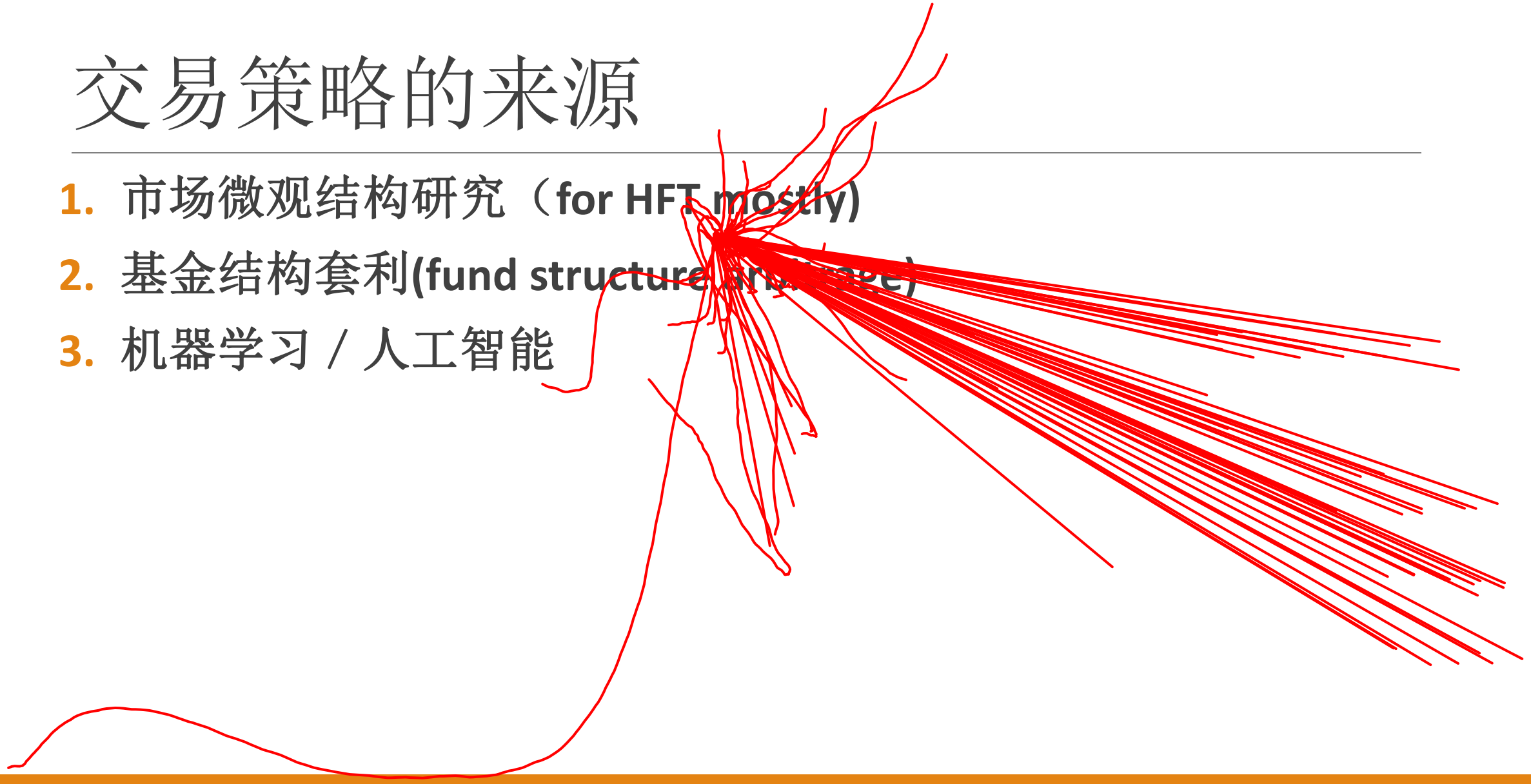
大前提：基于某种平台：

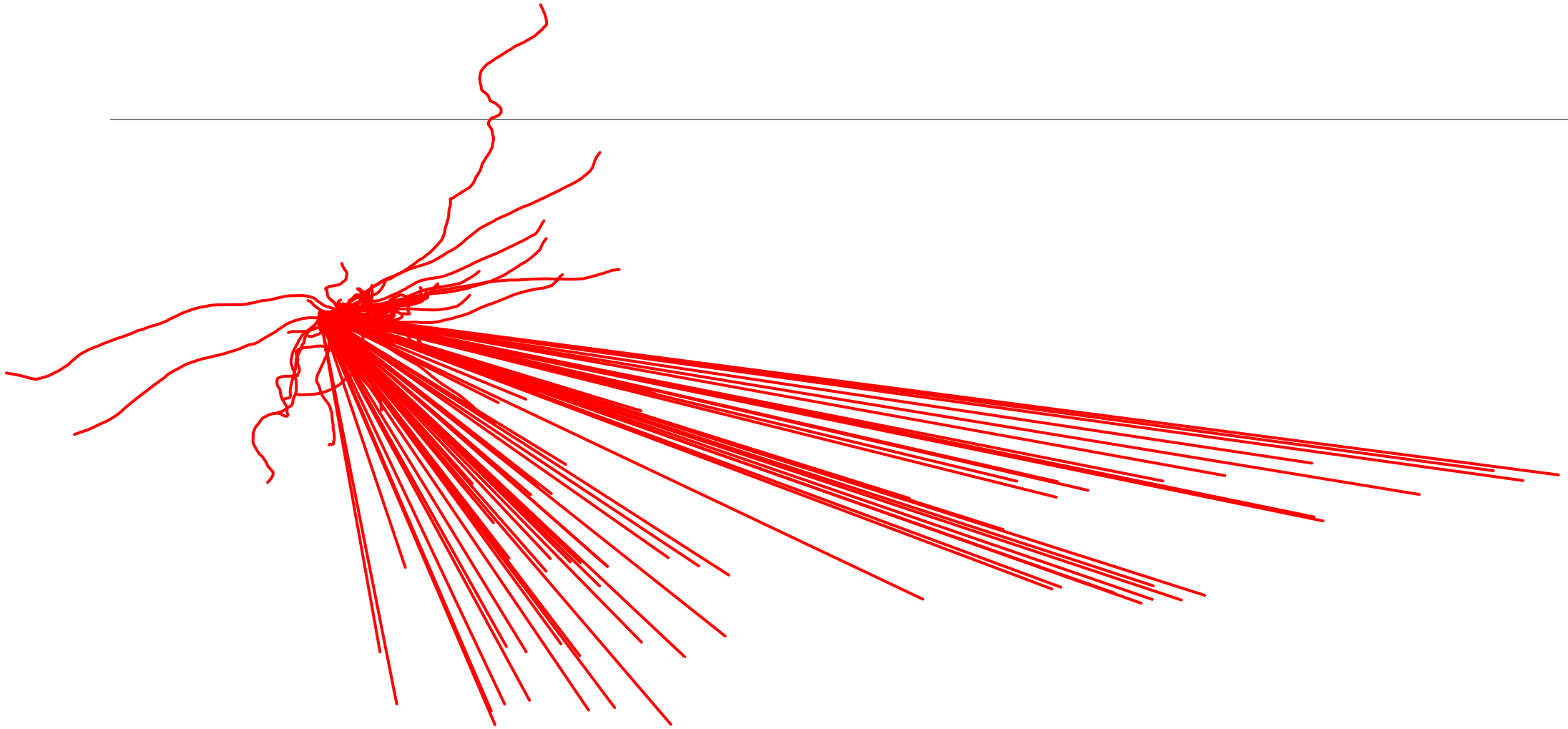
1. 提出假设
2. 建立模型
3. 回测验证
4. 执行交易

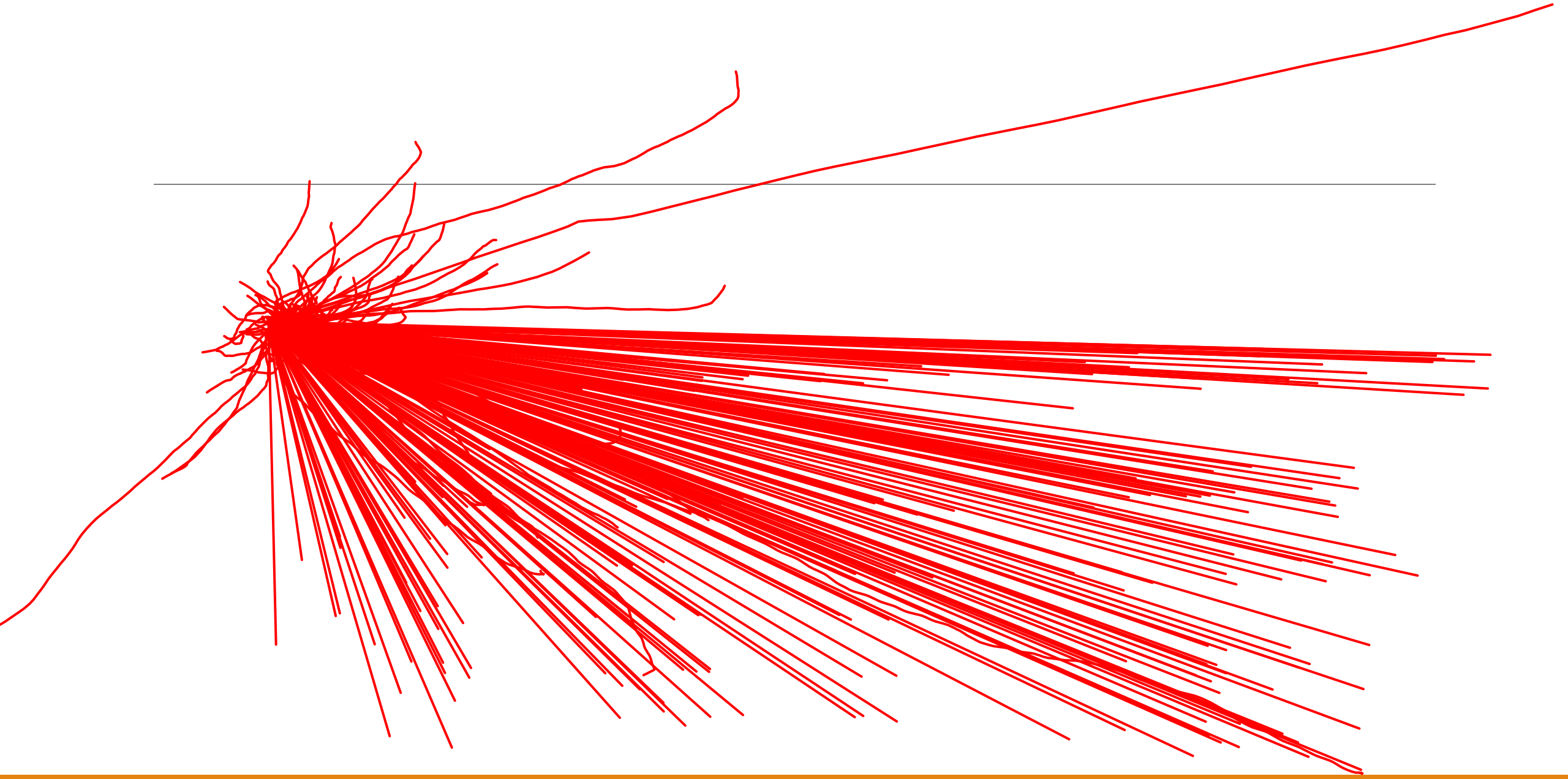


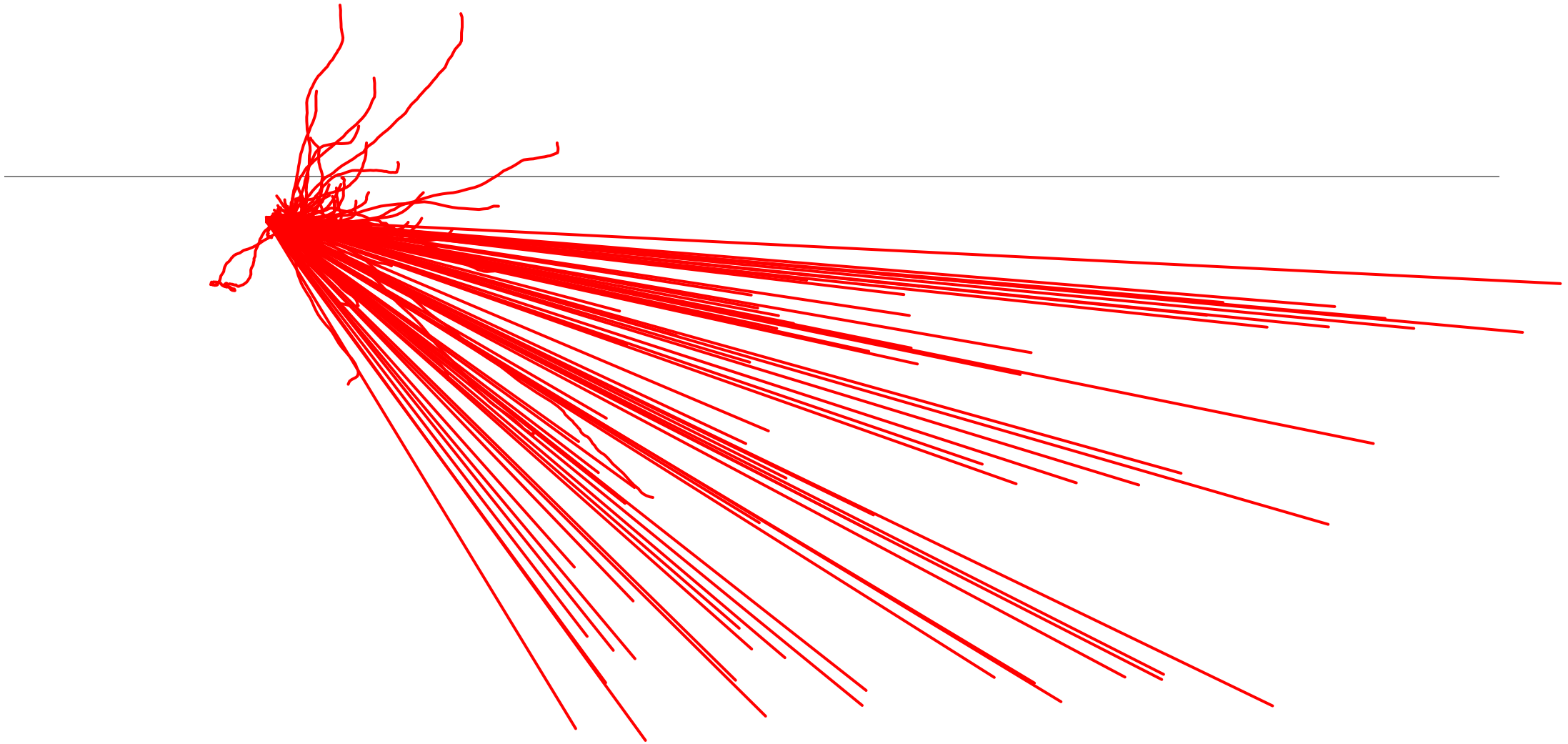
交易策略的来源

1. 市场微观结构研究（for HFT mostly)
2. 基金结构套利(fund structure arbitrage)
3. 机器学习 / 人工智能

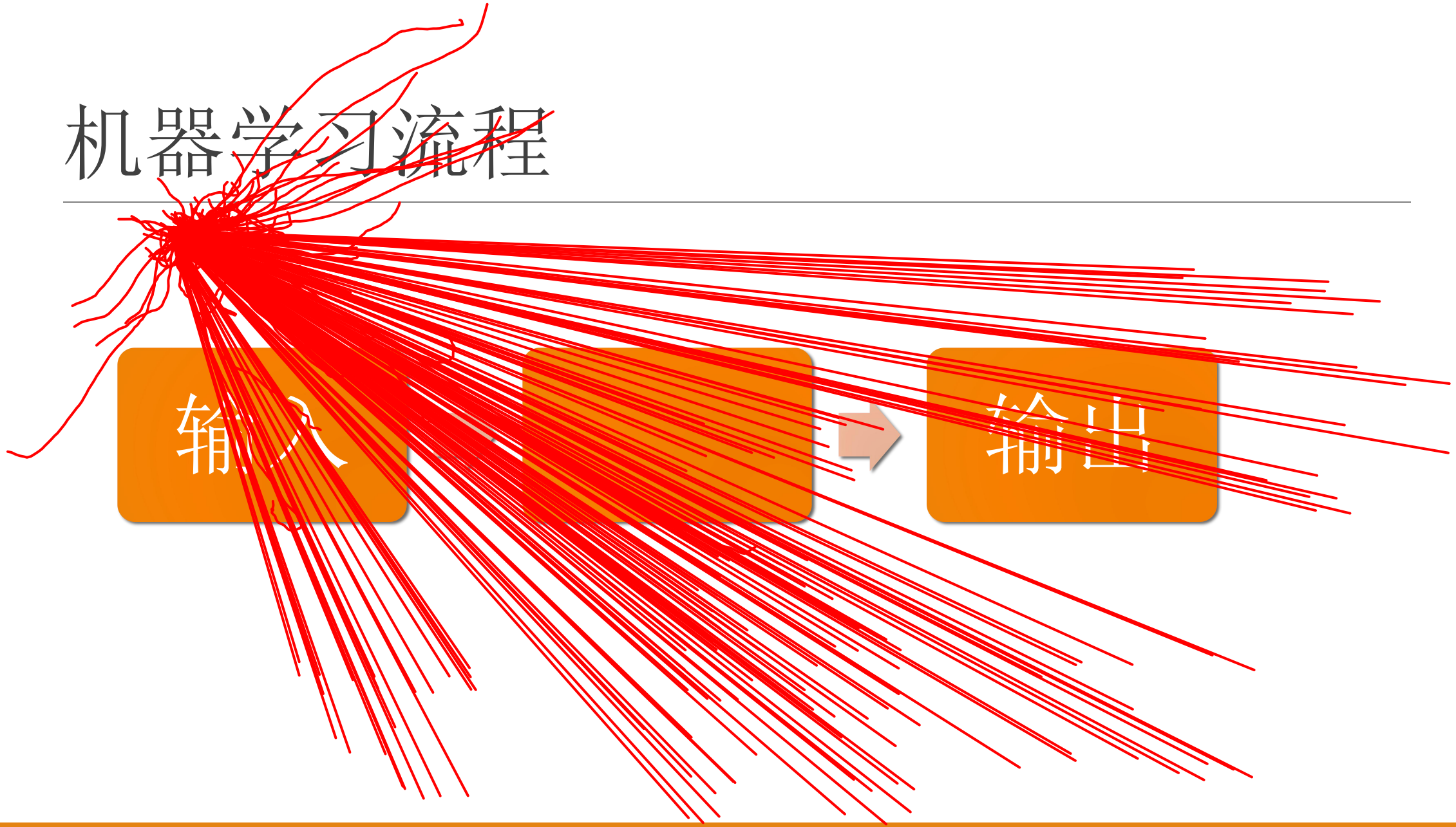




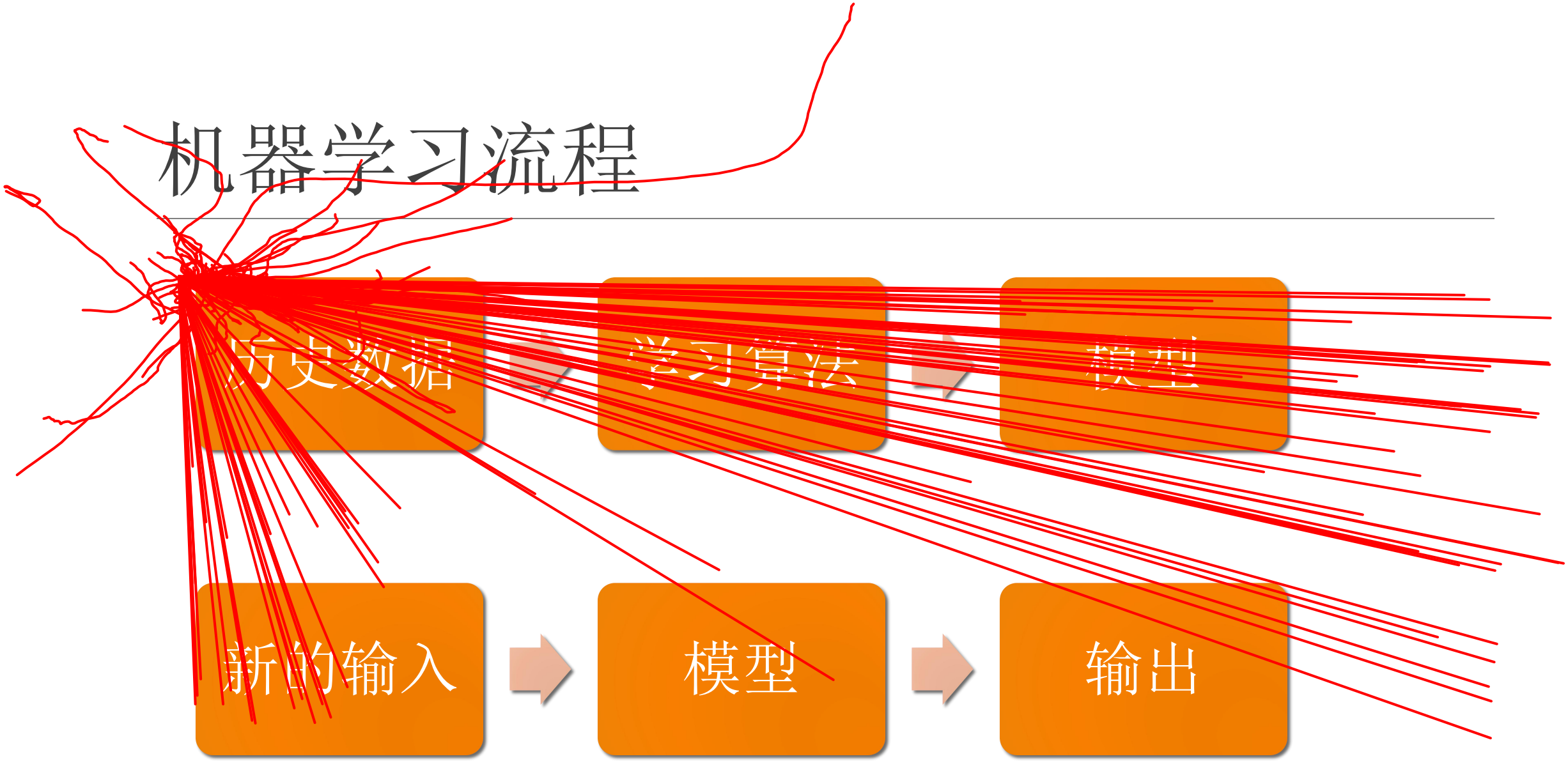




机器学习流程



机器学习流程



一个例子

Four paradigms of machine learning

Connectionism

Symbolism

Frequentists

Bayesian

A (super) Brief History of A.I

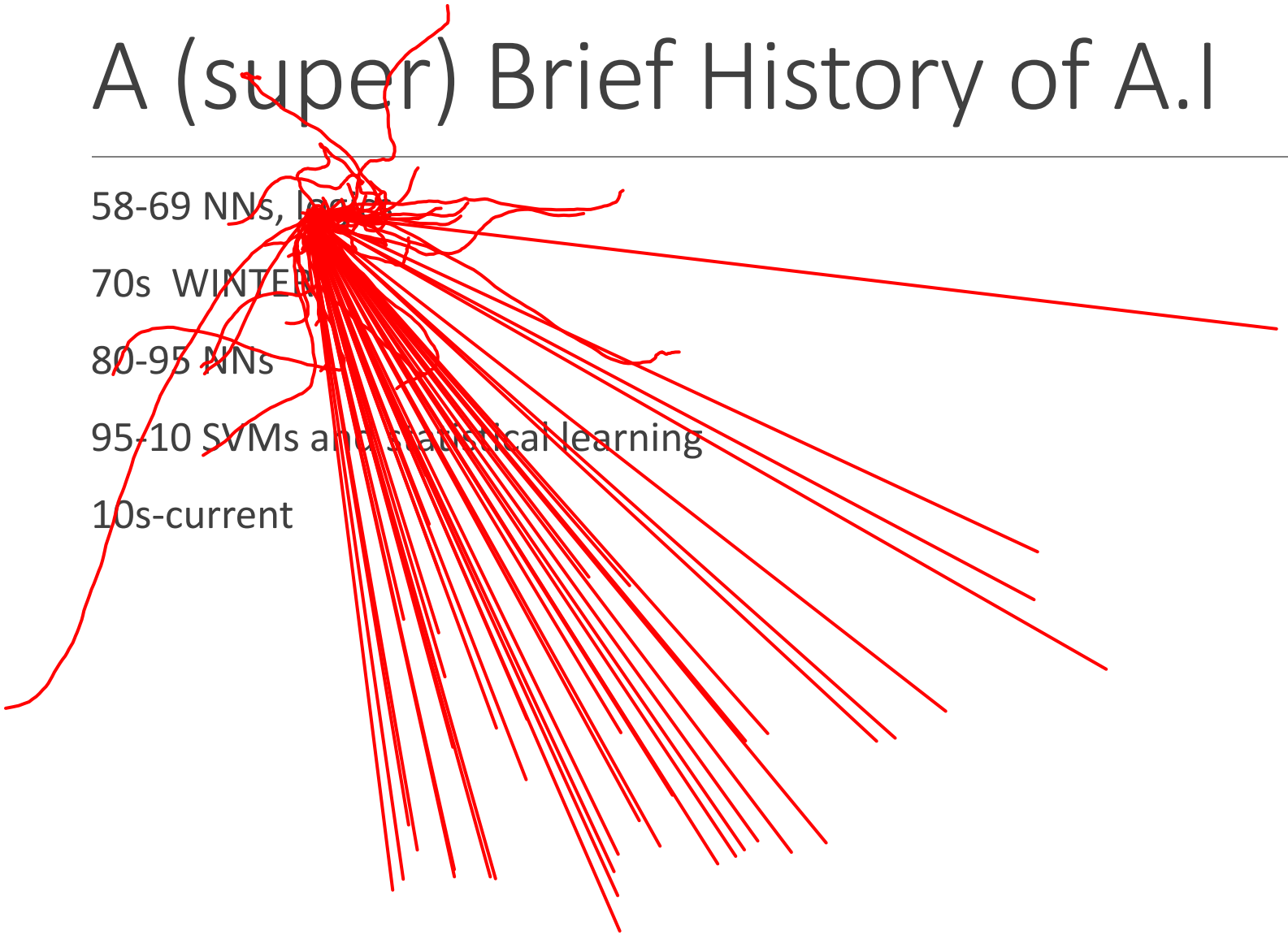
58-69 NNs, [illegible]

70s WINTER

80-95 NNs

95-10 SVMs and Statistical learning

10s-current



Machine Learning in a nutshell

Data

Model & Objective Function

Optimization

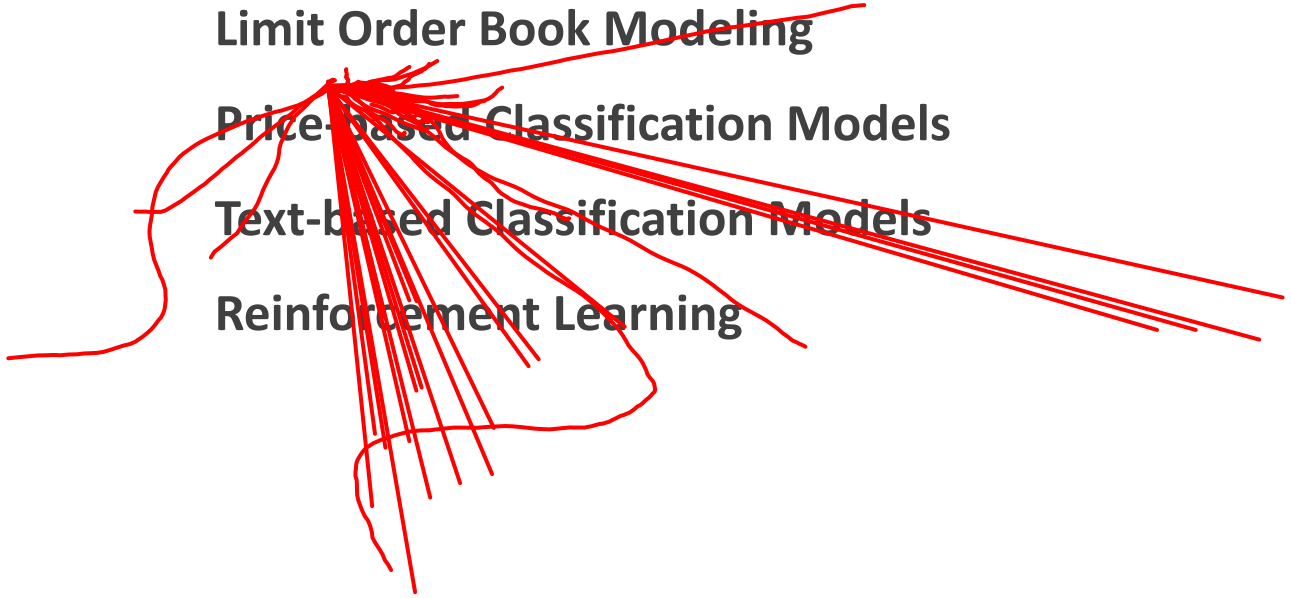
Machine Learning & Trading

Limit Order Book Modeling

Price-based Classification Models

Text-based Classification Models

Reinforcement Learning



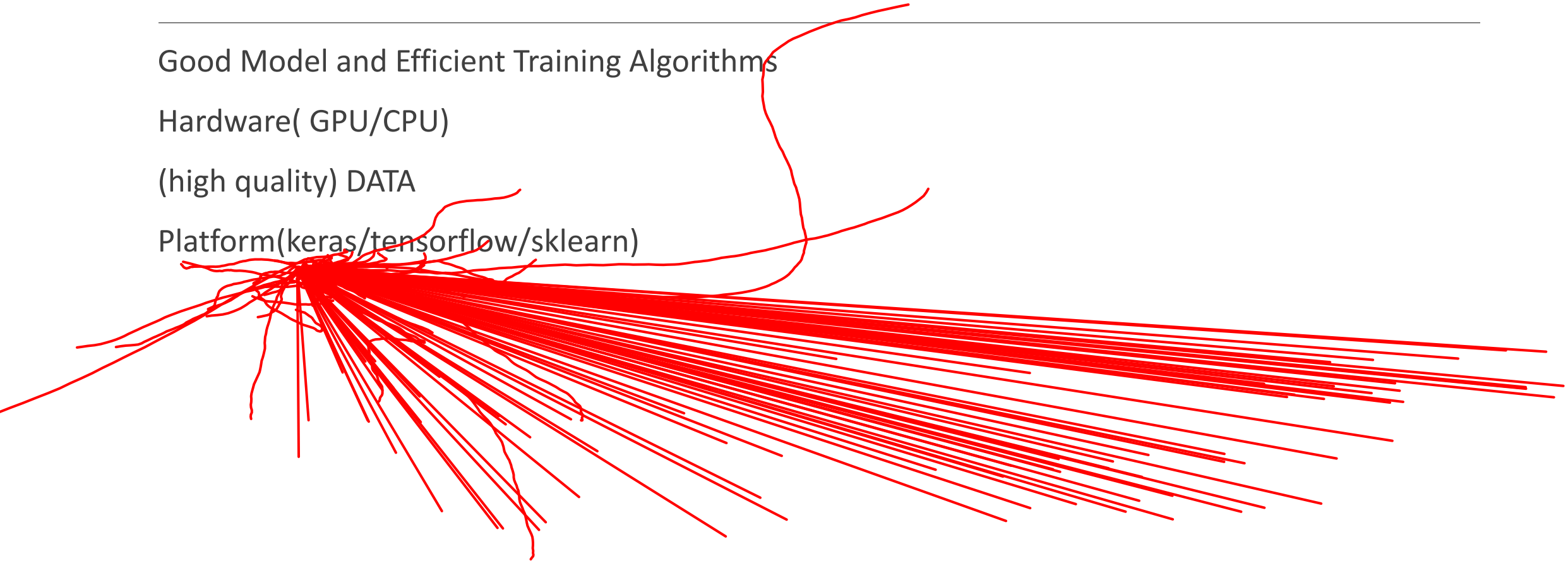
4 Key Factors that makes magic happens

Good Model and Efficient Training Algorithms

Hardware(GPU/CPU)

(high quality) DATA

Platform(keras/tensorflow/sklearn)

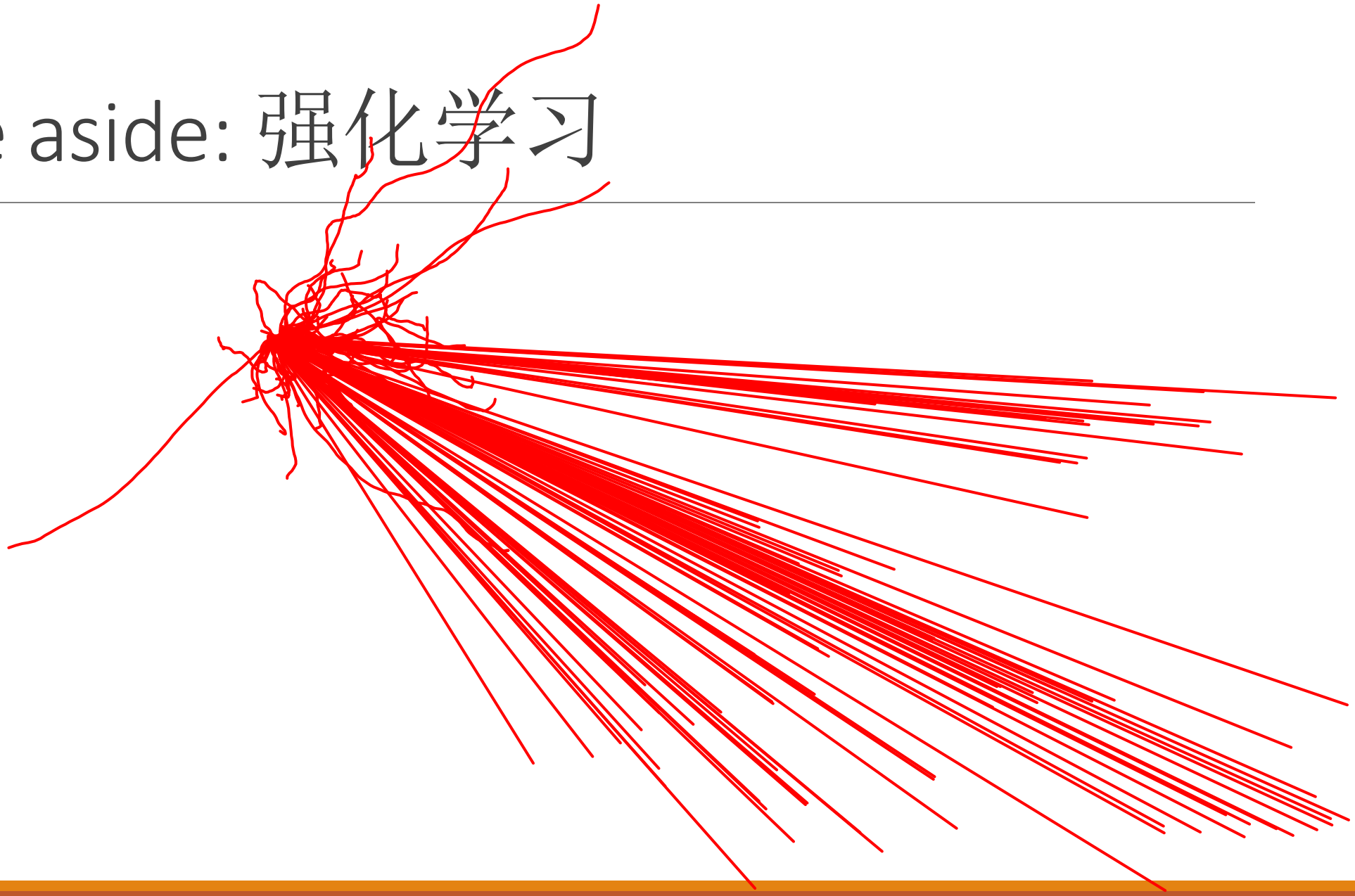


A little aside: 深度学习

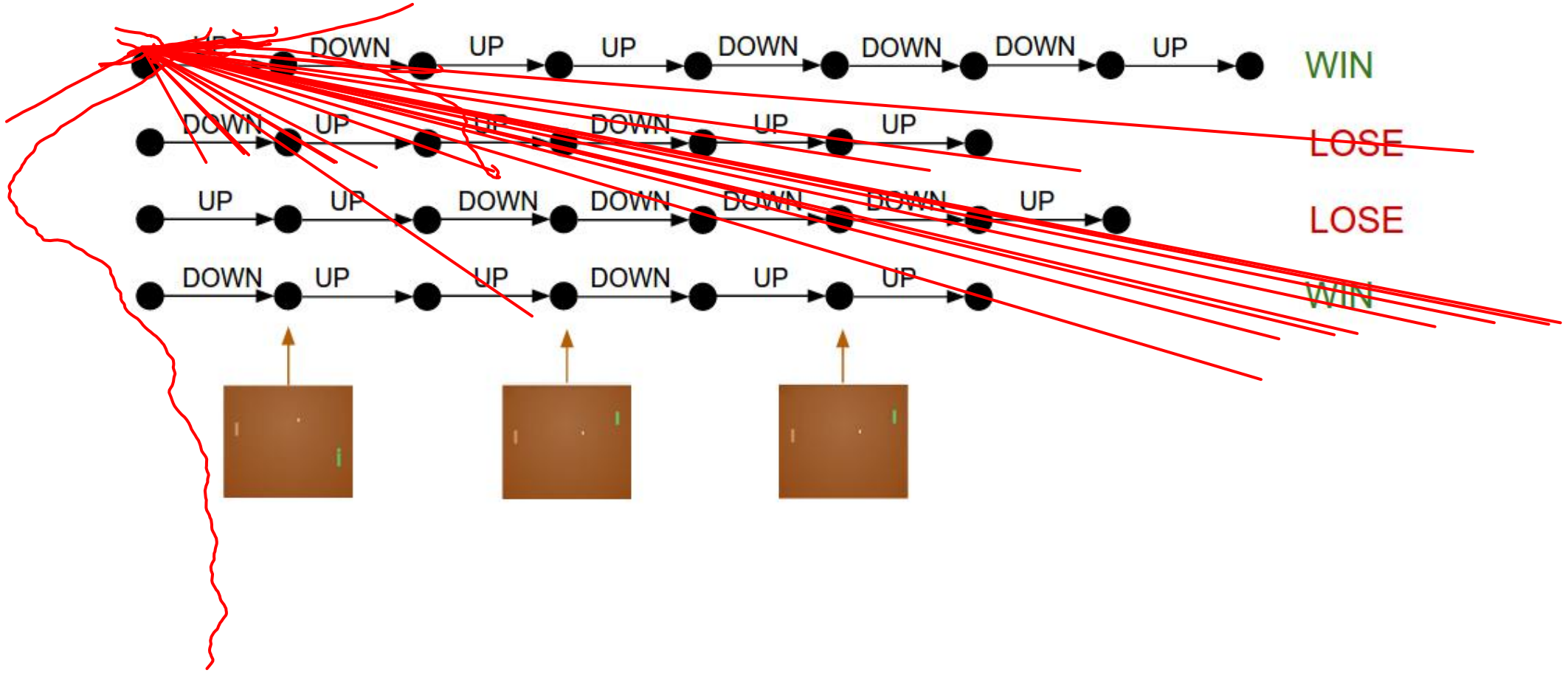
CNN for spatial data（空间）

LSTM for temporal data（时间）

A little aside: 强化学习



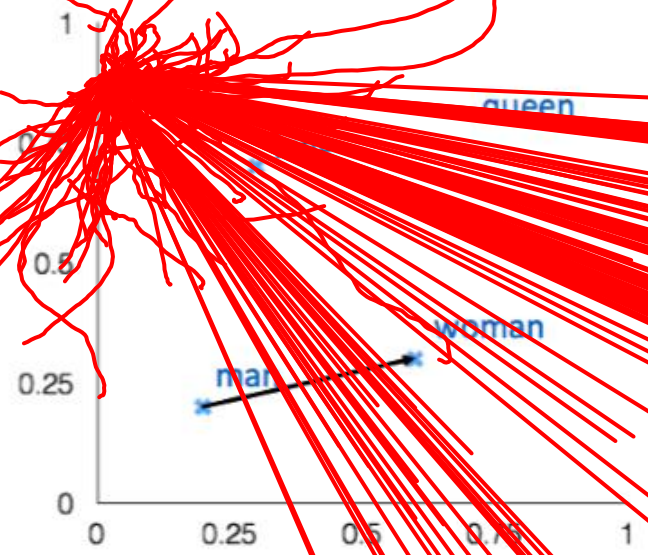
A little aside: 强化学习



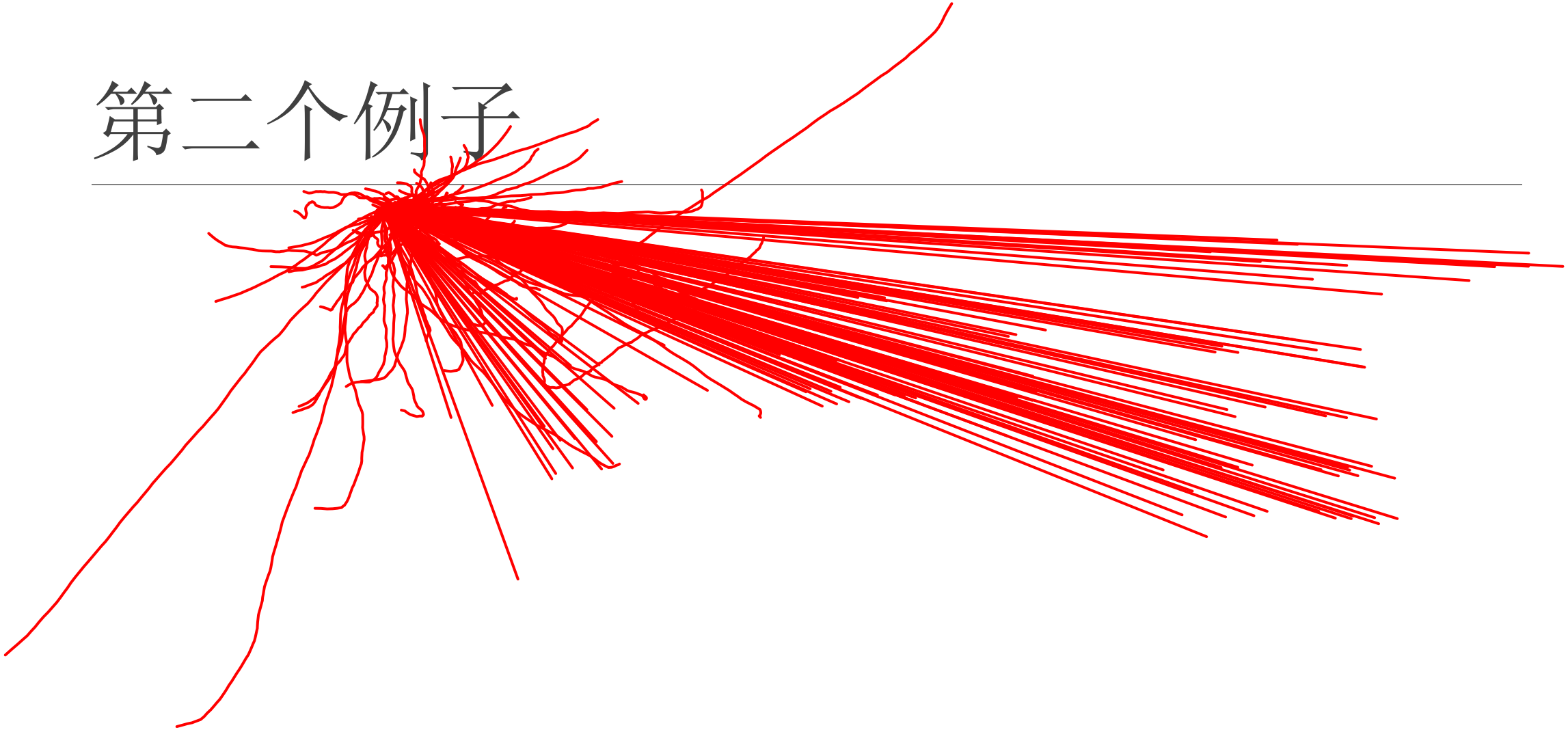
A little aside: 自然语言处理

man:woman :: king:?

+	king	[0.30 0.70]
-	man	[0.20 0.20]
+	woman	[0.60 0.30]
	queen	[0.70 0.80]



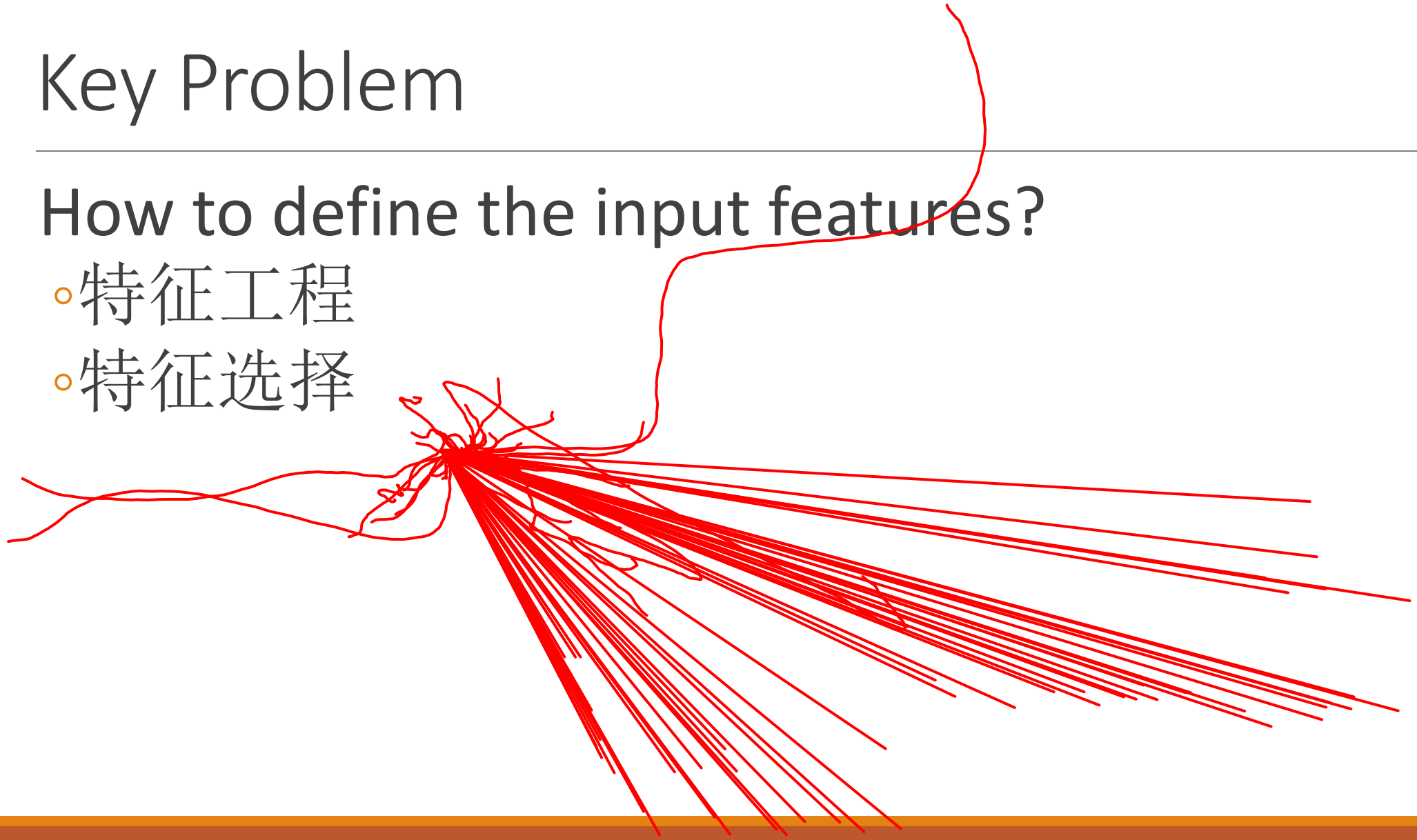
第二个例子



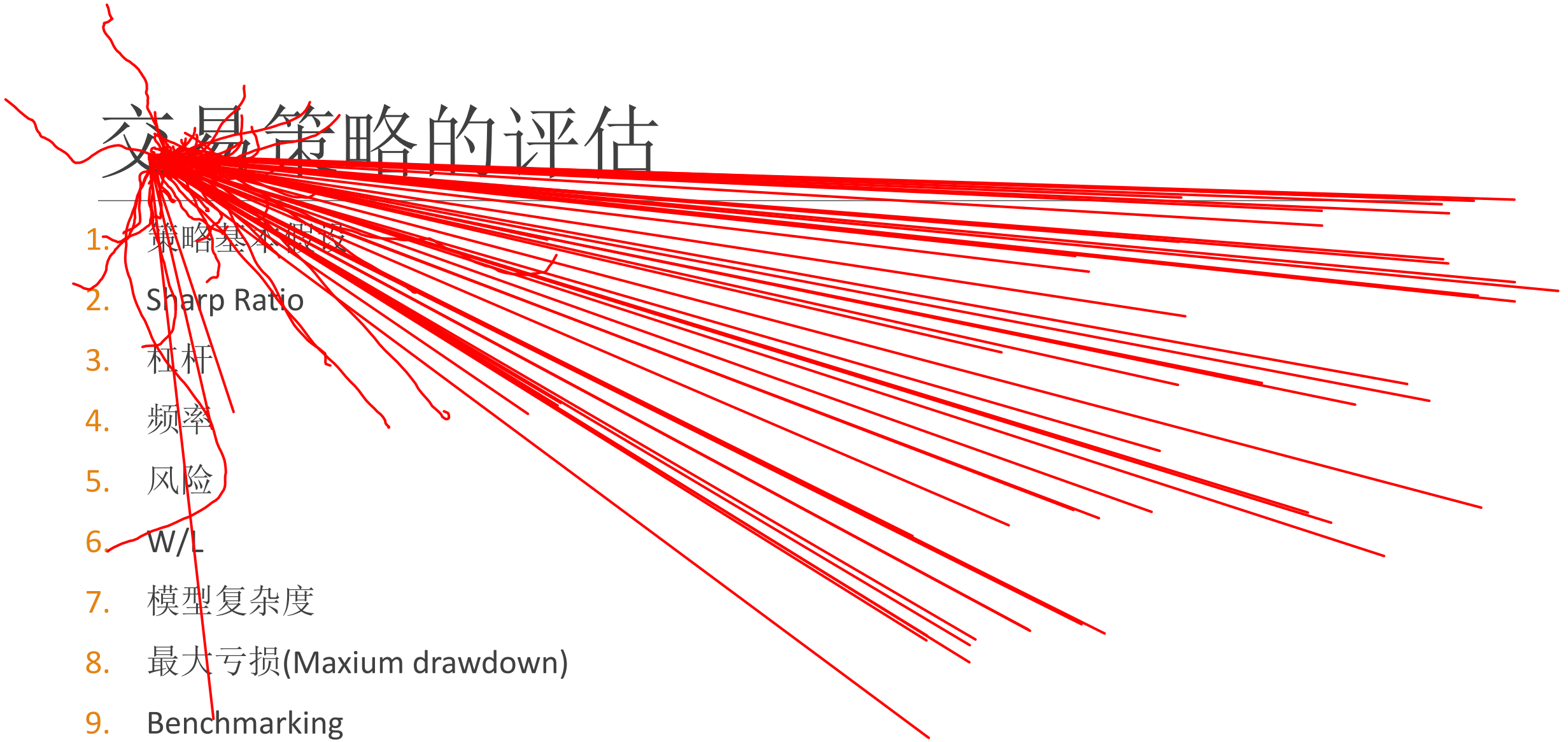
Key Problem

How to define the input features?

- 特征工程
- 特征选择



交易策略的评估

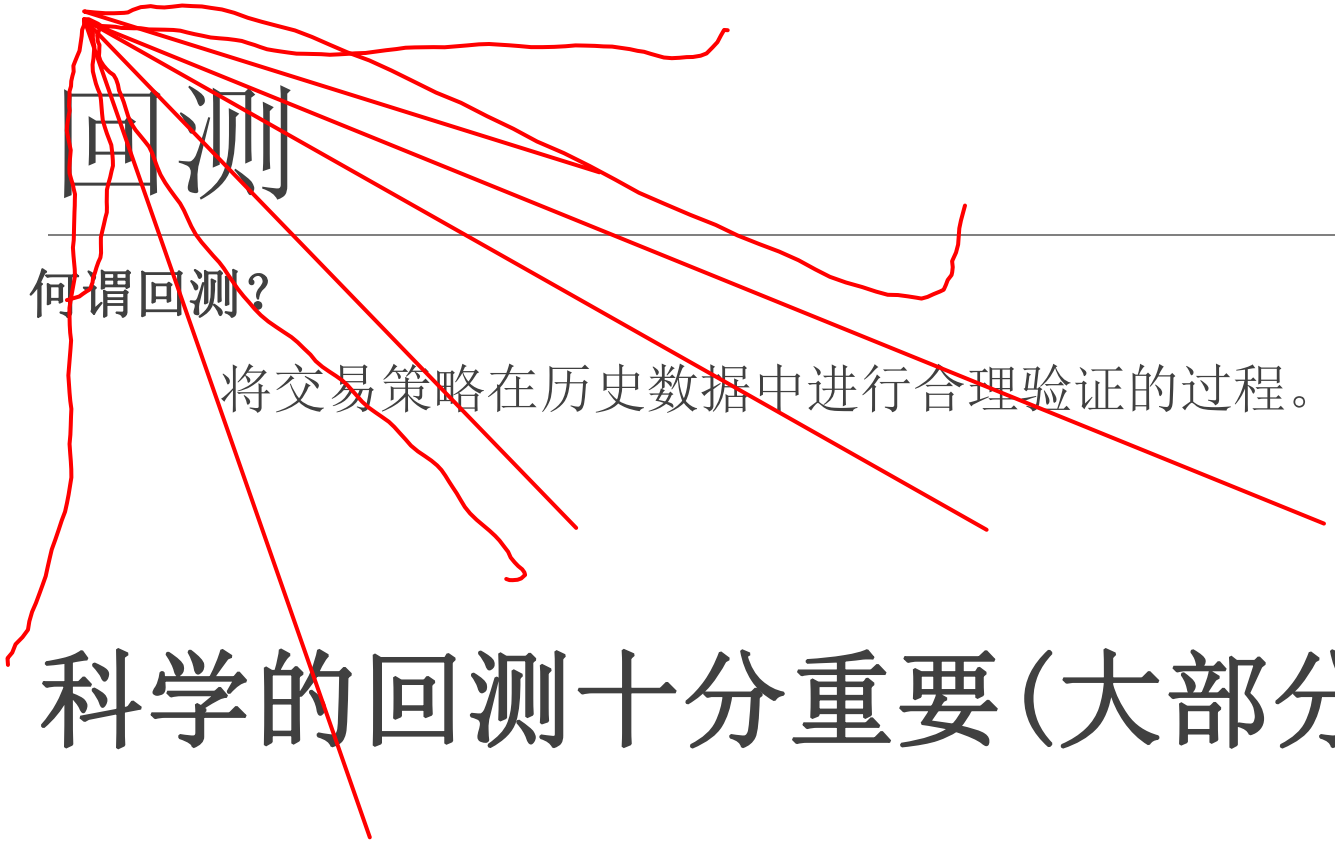


1. 策略基本假设
2. Sharp Ratio
3. 杠杆
4. 频率
5. 风险
6. W/L
7. 模型复杂度
8. 最大亏损(Maxium drawdown)
9. Benchmarking

回测

何谓回测？

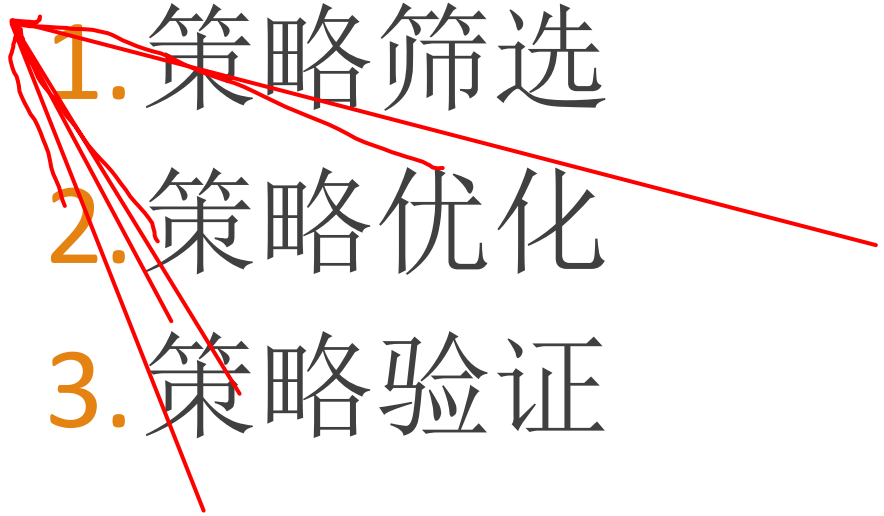
将交易策略在历史数据中进行合理验证的过程。



科学的回测十分重要(大部分人死在回测上)

回测的意义

1. 策略筛选
2. 策略优化
3. 策略验证

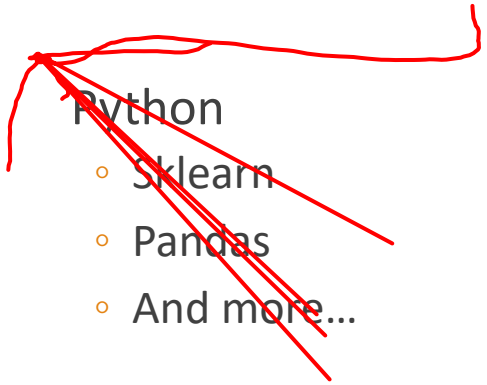


错误的回测方法

很多情况下，回测结果不错，实盘交易不尽如人意。
造成的偏差原因主要有：

1. 乐观主义偏差。(special look back region)
2. 时间旅行。
    1. 程序Bug
    2. Train/Val/Test set
3. 幸存者误差

工具和语言



- Python
  - Sklearn
  - Pandas
  - And more…

量化交易：从工程的角度

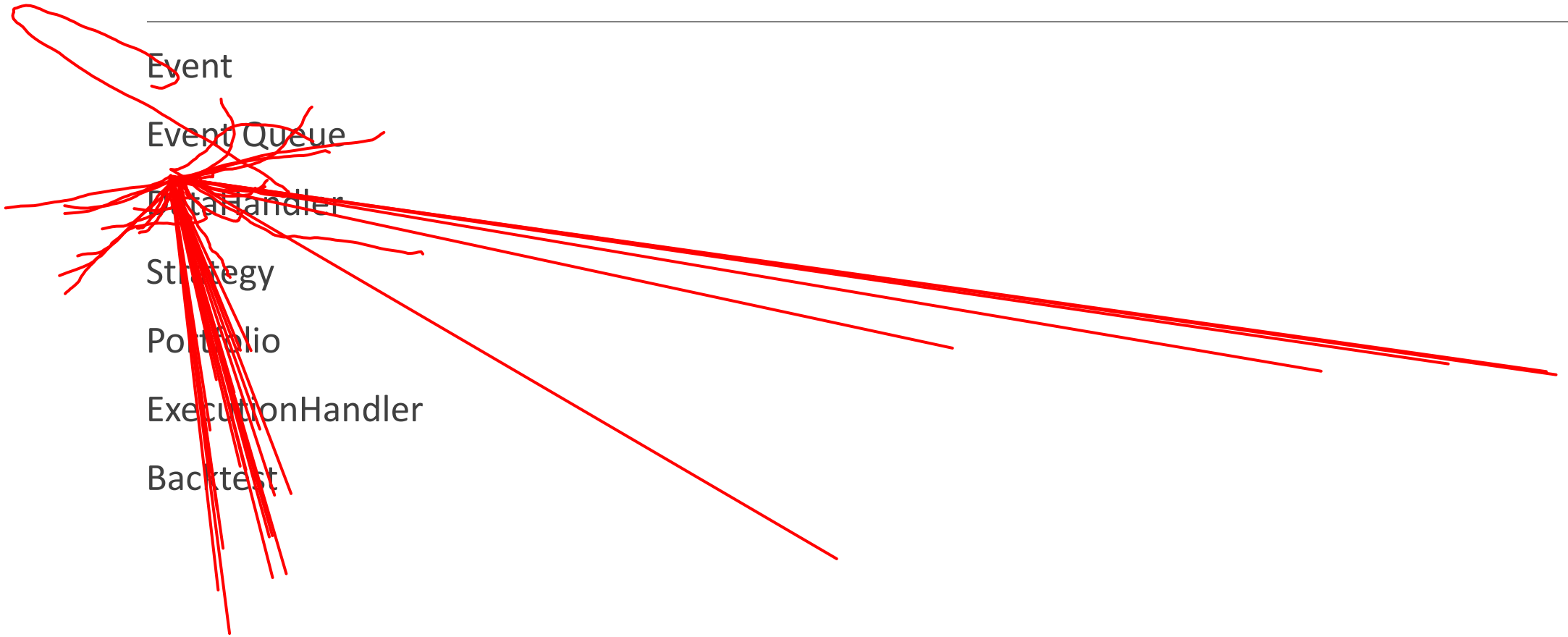
```
#event driven

while True:
    new_even = get_new_event()

    if new_event.something == "whatever"
        do_something()
    if new_event.something == "all right"
        do_something_else()

    tick(50) #wait 50 milliseconds
```

量化交易：从工程的角度



Event

Event Queue

DataHandler

Strategy

Portfolio

ExecutionHandler

Backtest

Next Time

一些金融基本知识

以及Python...