

香港中文大學(深圳)

The Chinese University of Hong Kong, Shenzhen

Towards a Novel Research — in a *Problem-driven* way

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Supervised by **Zhizheng Wu**

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Towards a **Novel** Research in a **Problem-driven** way

- About me



Xueyao Zhang (张雪遥)

First-year Ph.D. student, SDS

Homepage: <https://www.zhangxueyao.com/>

Research interest: **“AI + Music”**, especially on:

- ◆ **Singing Voice Synthesis**
- ◆ **Algorithmic Composition**

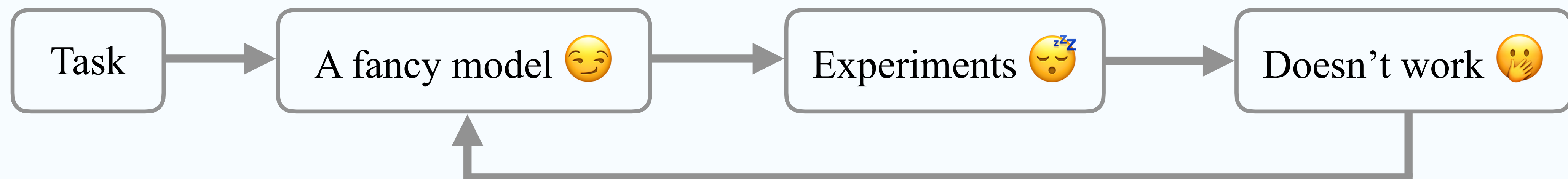
Before CUHK-SZ, I research **Computational Social Science** (especially on **Fake News Detection** and **Fact Checking**) during my master's degree at ICT-CAS.

***Friendly Tips:** What I'm talking today is highly based on my personal experiences in inter-discipline and applied research fields.*

Towards a **Novel** Research in a **Problem-driven** way

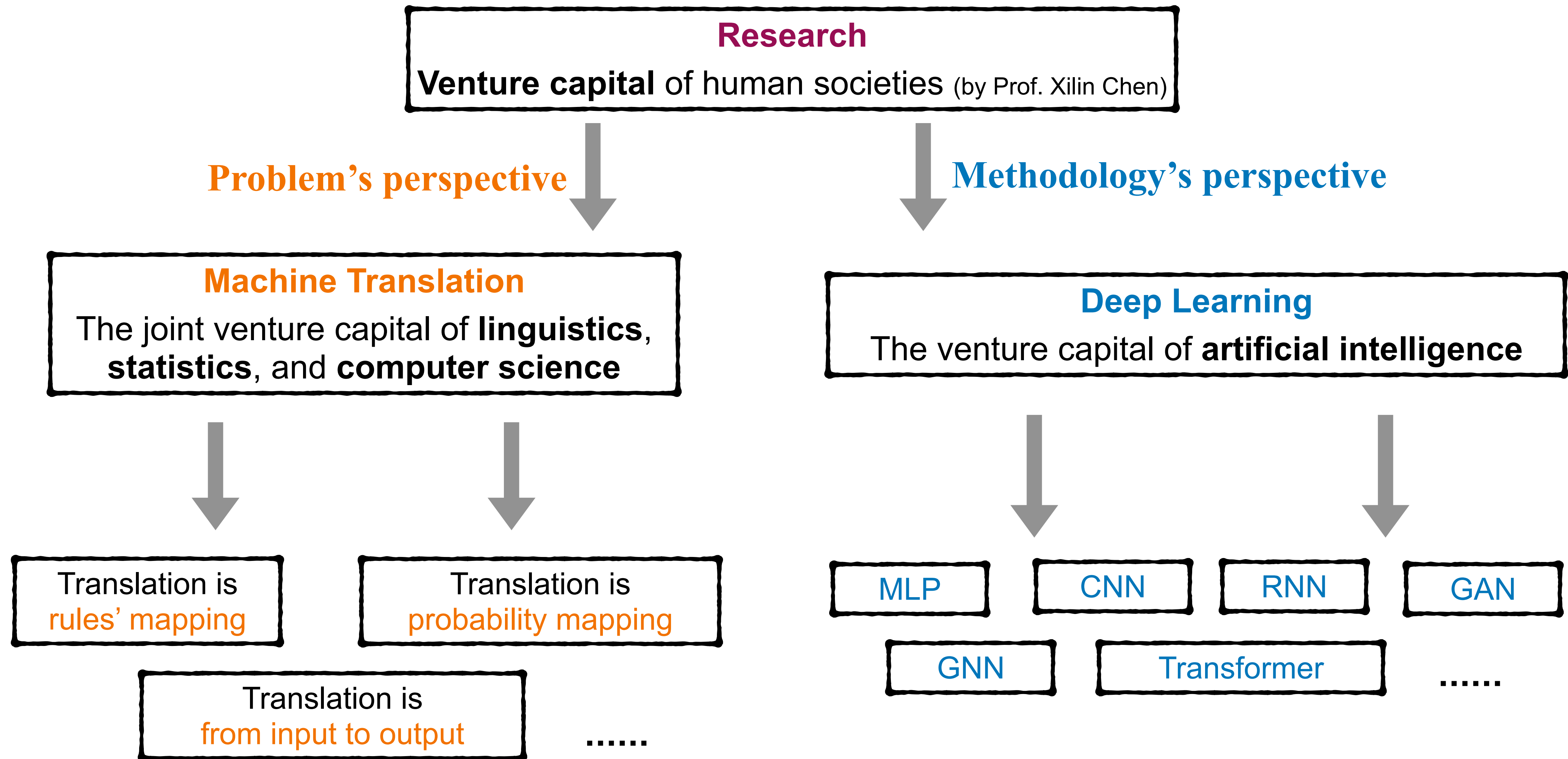
- **What is novel research?**
 - Novelty reveals itself as many ways as *beauty*. [1]
 - Our comments to these works: *novel, interesting, insightful, well-motivated...*
- **Problem-driven v.s. Methodology-driven**

Methodology-driven Trap for our junior researchers



[1] Michael J. Black. **Novelty in Science** — a guide for reviewers, 2022.

Research Taxonomy: Problem's or Methodology's perspective



Research Taxonomy: Problem's or Methodology's perspective

Problem need to be done methodically

Research
Venture capital of human societies (by Prof. Xilin Chen)

Methodology need to be verified by problems

Problem's perspective

Methodology's perspective

Machine Translation

The joint venture capital of linguistics, statistics, and computer science

Deep Learning

The venture capital of artificial intelligence

Translation is rules' mapping

Translation is probability mapping

Translation is from input to output

.....

MLP

CNN

RNN

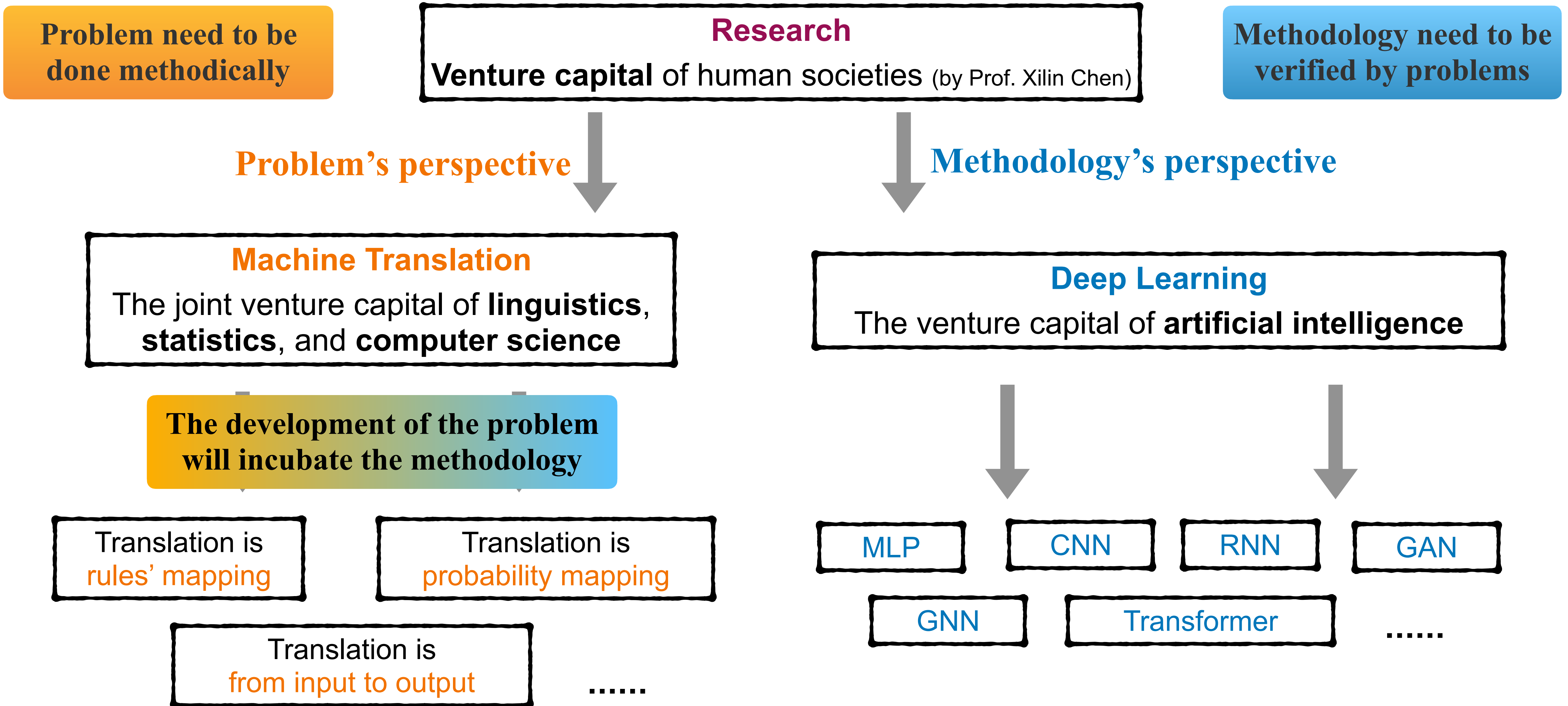
GAN

GNN

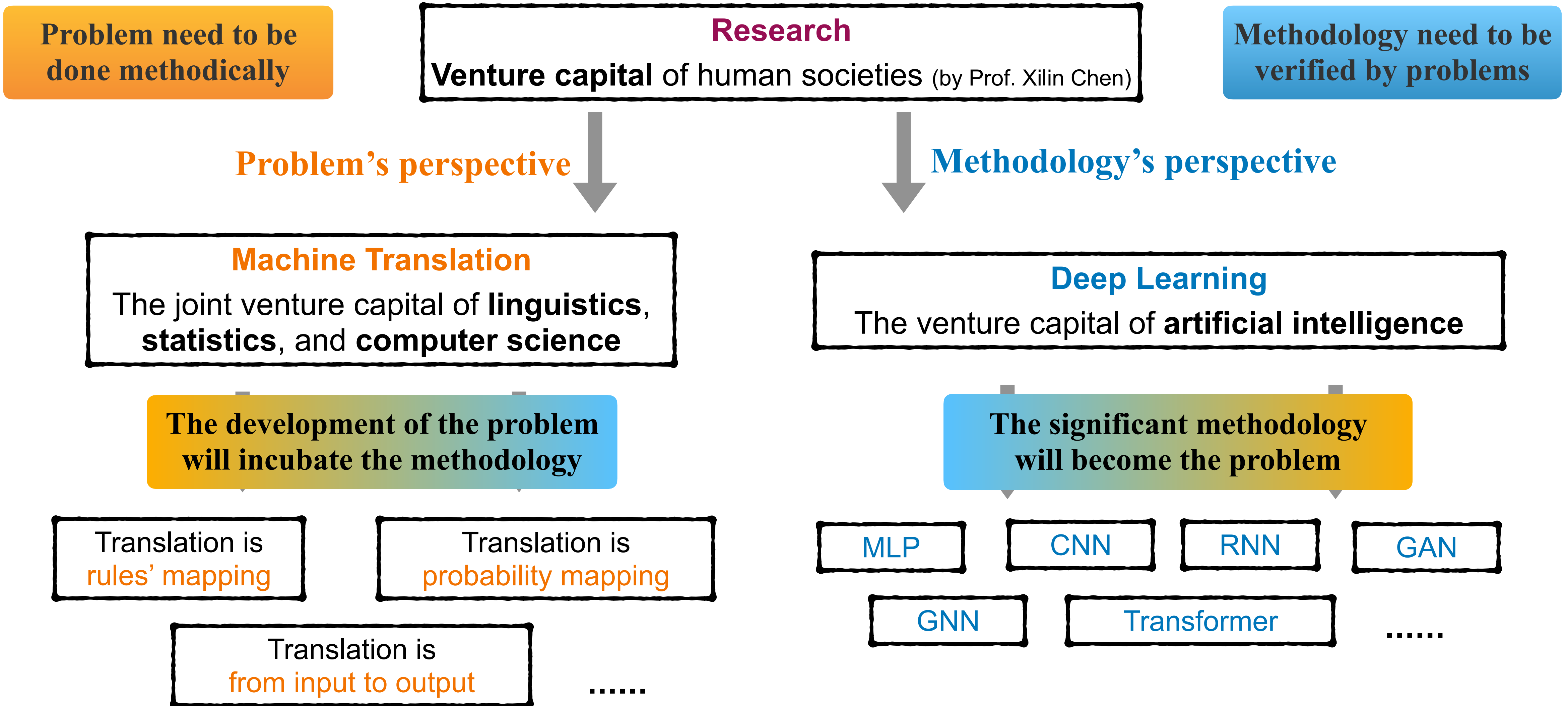
Transformer

.....

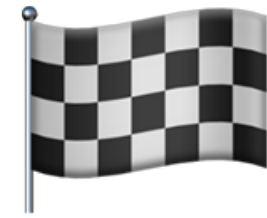
Research Taxonomy: Problem's or Methodology's perspective



Research Taxonomy: Problem's or Methodology's perspective



Problem-driven v.s. Methodology-driven



Problem-driven v.s. Methodology-driven



Problem-driven v.s. Methodology-driven



Faster



Problem-driven v.s. Methodology-driven



Faster



Safer



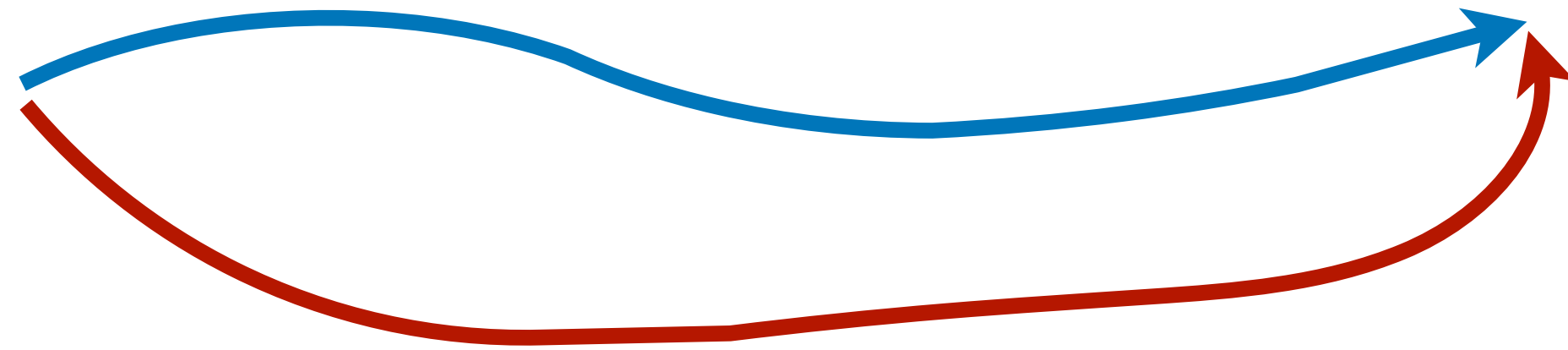
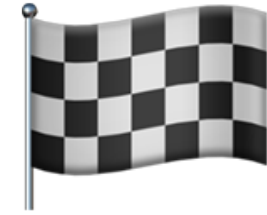
Problem-driven v.s. Methodology-driven



Faster

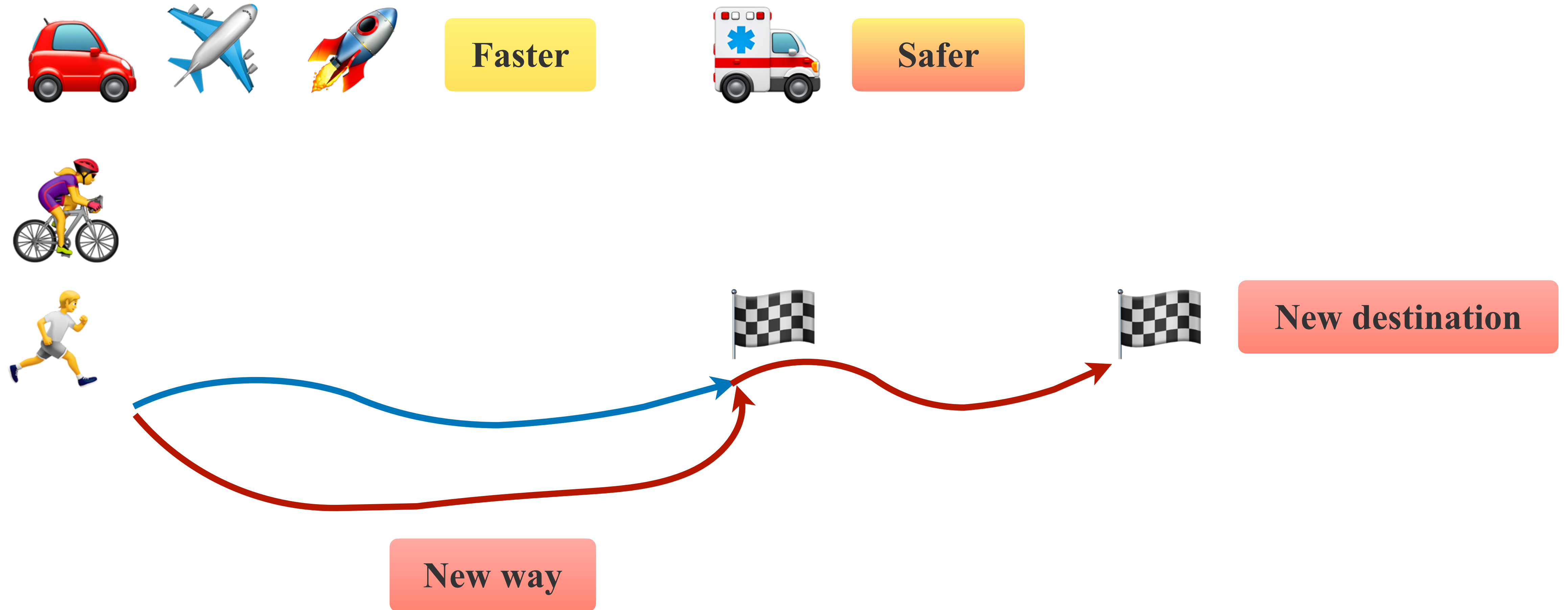


Safer



New way

Problem-driven v.s. Methodology-driven



How to conduct research in a problem-driven way?

The following are some of our representative works on **fake news detection**:

- **WWW'21** “**Novel idea**”; **109 citations up to now**

Xueyao Zhang, et al. Mining Dual Emotion for Fake News Detection.

- **CIKM'21** “**Well-motivated**”, “**Novel method**”

Qiang Sheng*, Xueyao Zhang*, et al. Integrating Pattern- and Fact-based Fake News Detection via Model Preference Learning.

- **ACL'21** “**Important problem**”

Qiang Sheng, Juan Cao, Xueyao Zhang, et al. Article Reranking by Memory-enhanced Key Sentence Matching for Detecting Previously Fact-checked Claims.

- **ACL'22** “**Interesting idea**”, “**Easy to understand**”

Qiang Sheng, Juan Cao, Xueyao Zhang, et al. Zoom Out and Observe: News Environment Perception for Fake News Detection.

The traditional school of fake news detection

Veracity Prediction

“True or false” classification task

Text features

Vision features

User features

Propagation features

...

Better feature extraction

To construct a strong **feature extractor**

Case 1: Backing to researches of social psychology

Content

Astonished and angry

A **massacre** happened with a **violent** house demolition, **killing** a family of seven! But the **disgusting** local government is still blocking the news. Waiting for a thorough investigation!

Comments

Angry and disgusting

Another **f**king** house demolition!

...

The **killers** will not confess their crimes easily!

...

The **disgusting** government!

A fake news on Weibo (which has been translated)

Case 1: Backing to researches of social psychology

The Psychology of Rumor, 1947 [1]

MOTIVES IN RUMOR MONGERING 37

It is important to note here the complex purpose that rumor serves. By permitting one to slap at the thing one hates it *relieves* a primary emotional urge. But at the same time—in the same breath—it serves to *justify* one in feeling as he does about the situation, and to *explain* to himself and to others why he feels that way. Thus rumor rationalizes while it relieves. “Why shouldn’t I dislike Russia? It came to our aid only at the cost of an enormous bribe. . . .” “Why shouldn’t I feel panicky? Our fleet was wiped out at Pearl Harbor. . . .” “Why shouldn’t I distrust the Jews? They are so clannish. . . .” “Why shouldn’t I feel superior to my neighbor? I don’t indulge in his irregularities of living. . . .”

- ① Rumor **relieves a primary emotional urge**.
- ② Rumor serves to **justify one in feeling** as he does about the situation.
- ③ Rumor spreader aims to **explain to himself and to others** why he feels that way.

Inside Rumor: A Personal Journey, 1991 [2]

Personal Anxiety

The third variable that I noted, personal anxiety, is without a direct counterpart in the basic law of rumor. G. W. Allport and Postman (1947) did raise the possibility that ambiguity might be “induced . . . by some emotional tensions that make the individual unable or unwilling to accept the facts set forth in the news” (p. 33). By *personal anxiety*, as I shall use the term, I mean an affective state—acute or chronic—that is produced by, or associated with, apprehension about an impending, potentially disappointing outcome (Rosnow, 1980). Here, the hypothesis is that rumors persist not only because they play on cognitive unclarity, but also because they give vent or expression to emotional tensions attributable to the nature of anticipated outcomes (cf. G. W. Allport & Postman, 1947; Ambrosini, 1983; Festinger, 1957; Hart, 1916; Jung, 1910, 1959; Loewenberg, 1943).

The **personal anxiety** should be merged in the basic law of rumor of [1].

Rumor ~ Importance × Ambiguity × **Personal Anxiety**

[1] Allport G W, Postman L. The psychology of rumor. Henry Holt, 1947.

[2] Ralph L Rosnow. Inside rumor: A personal journey. American psychologist, 1991.

Case 1: Backing to researches of social psychology

Veracity Prediction

“True or false” classification task

Text features

Vision features

User features

Propagation features

Emotion features

New features

To construct a strong feature extractor

Case 2: Combine the external evidences and facts

Veracity Prediction

“True or false” classification task

Text features

Vision features

User features

Propagation features

Emotion features

To construct a strong **feature extractor**

Content

Almost none emotions

[Dog abuse in Yibin]

A man entered the elevator room. He kicked and kicked a puppy, and then the puppy fell to the ground and could not move.

Comments

Angry and disgusting

What a **cruel** guy

...

Forward. Make the **freak** on the map.

...

Bastard! Wish all your family die!

A **real** news on Weibo (which has been translated)

Hard samples

Case 2: Combine the external evidences and facts

Veracity Prediction

“True or false” classification task

Text features

Vision features

User features

Propagation features

Emotion features

To construct a strong **feature extractor**

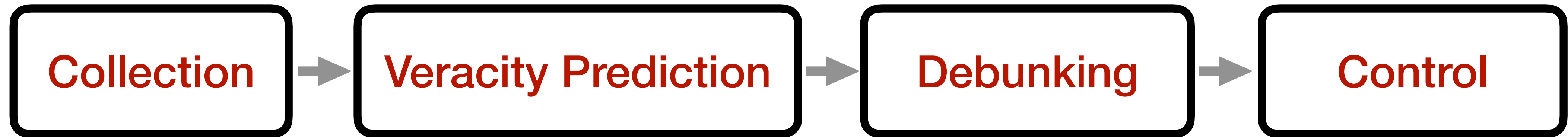
Pattern-based Detector

Evidence features

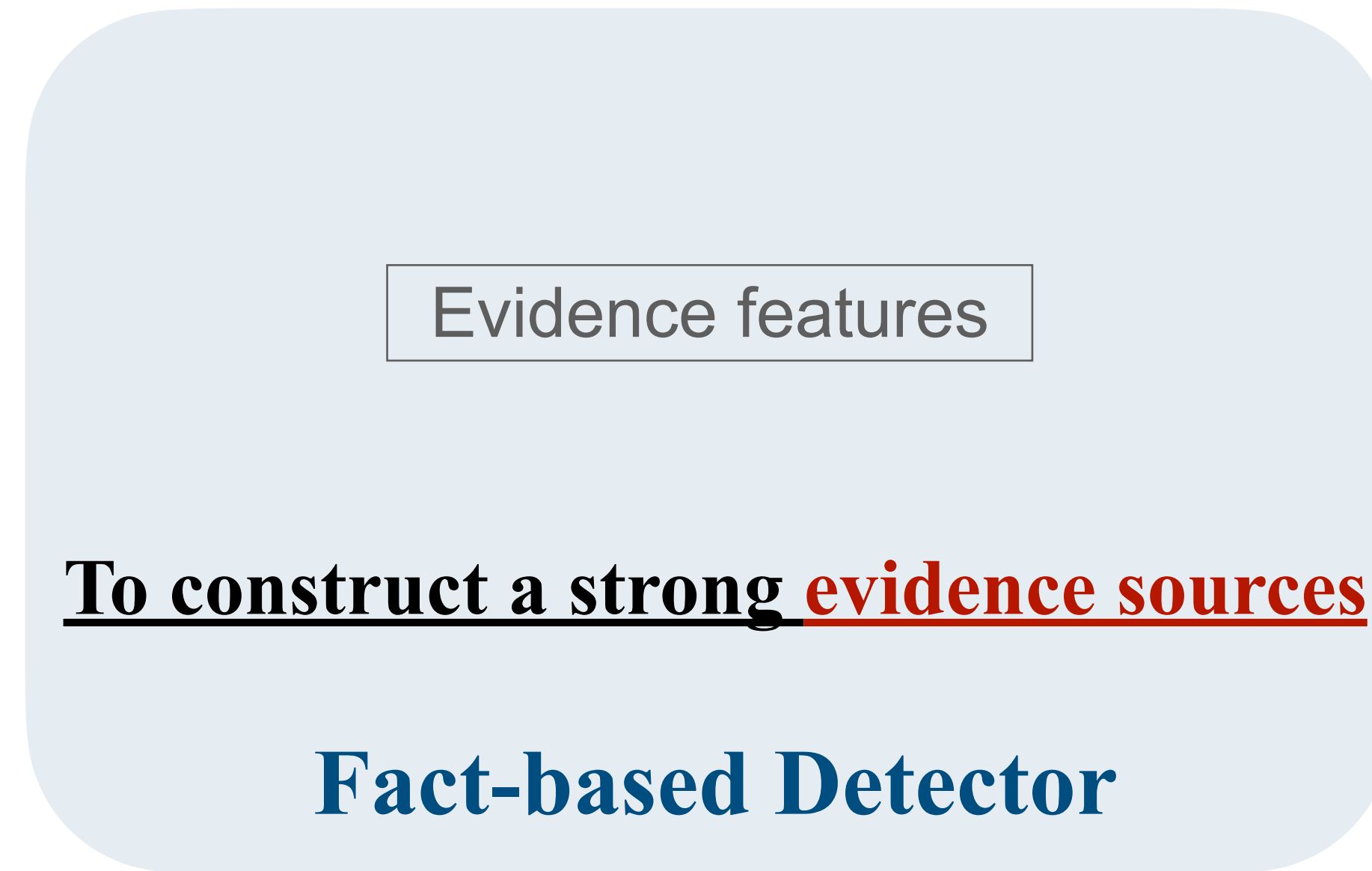
To construct a strong **evidence sources**

Fact-based Detector

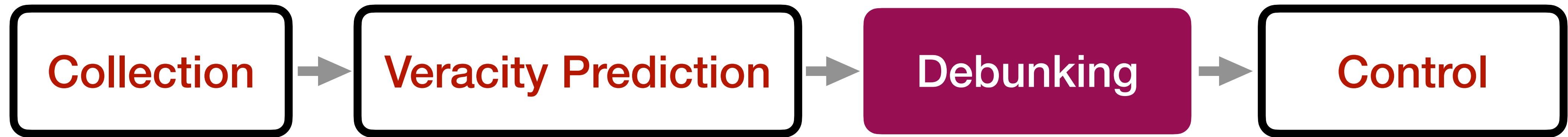
Case3: Move on to the lifecycle of fake news detection



“True or false” classification task



Case3: Move on to the lifecycle of fake news detection



Pope Francis used to be a metal head. Here's a picture of him in a Black Sabbath t-shirt.

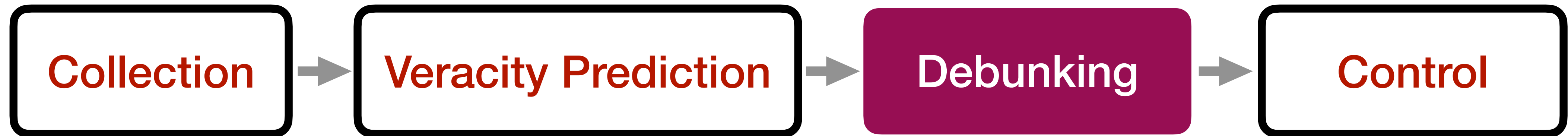
CIKM'18

Attention Visualization on Posts

Post: It's so sad!!!!!!!!!!!!!! Hundreds of firefighters died in forest fires. The bodies of firefighters were found one after another, and people could not hide their grief and upset. It is said the cause of the fire is old power facilities.

ECAI'20

Case3: Move on to the lifecycle of fake news detection



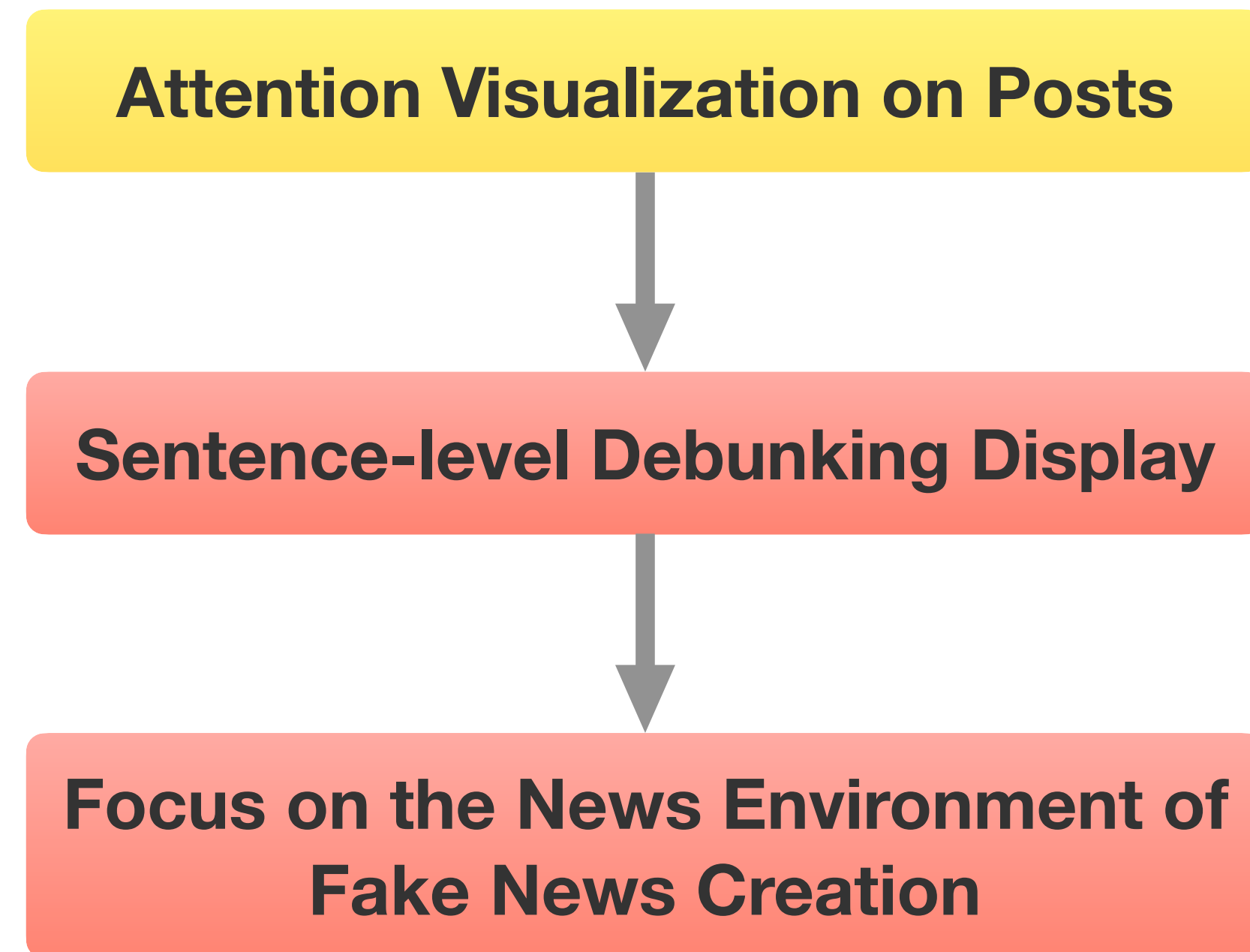
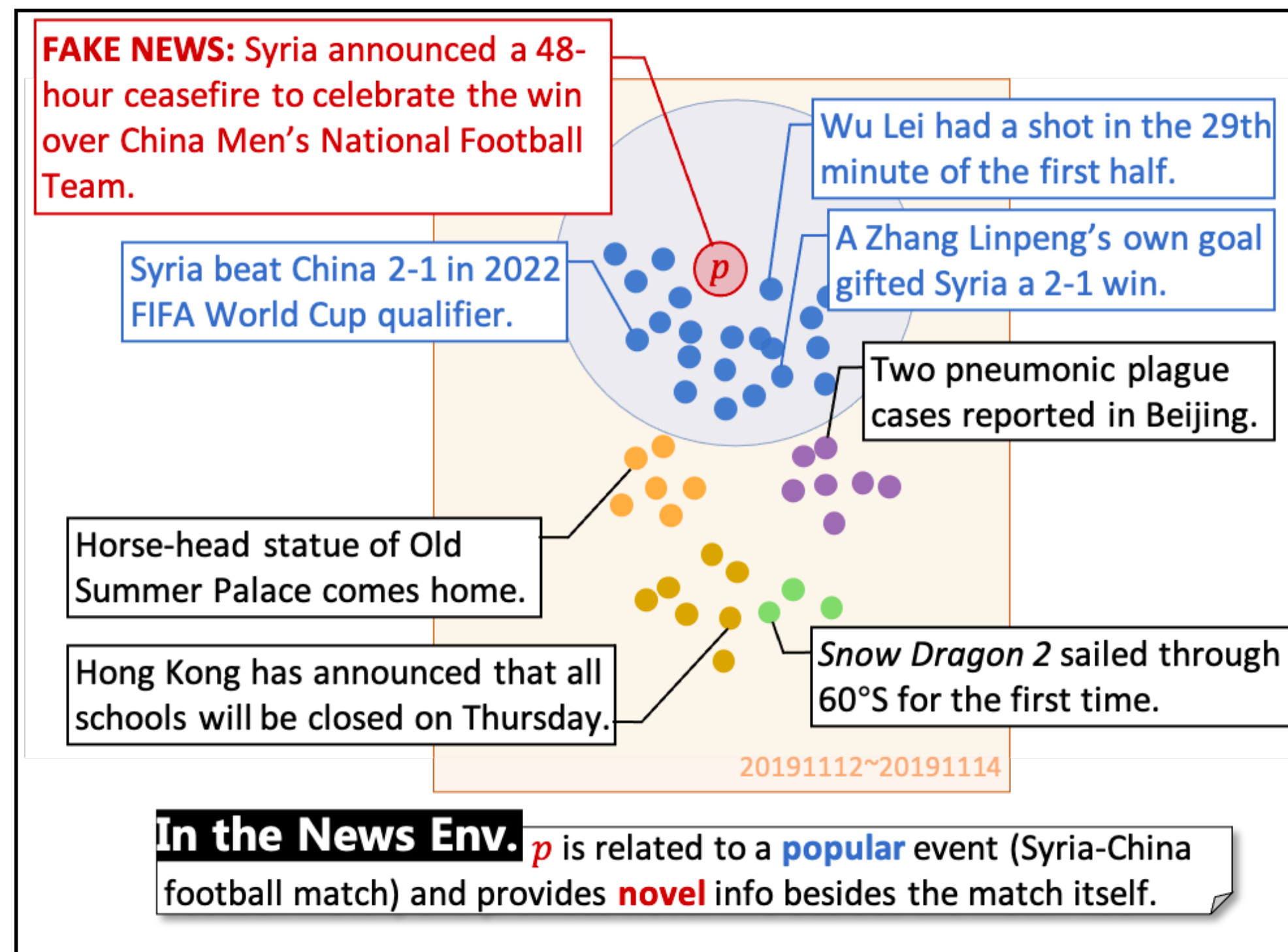
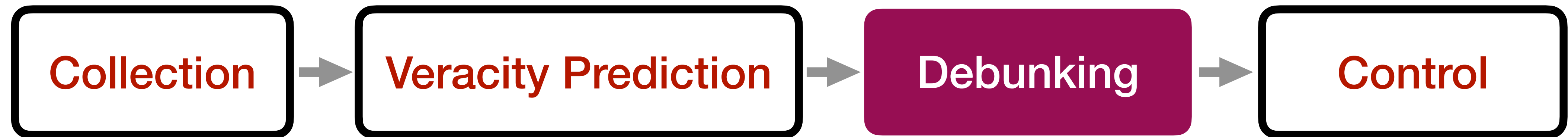
Claim	Is this to make the so-called artificial eggs? Surprising! #video
Key Sentences	
KS1.	Recently, a short video that claims a production process of the artificial fake eggs has widely spread in WeChat Groups.
KS2.	The reporter of Shanghai Observer found that the video actually recorded making toy eggs, which were not to pretend as real eggs for sale.
KS3.	Relating the video of toy egg production to food safety issues is just a gimmick used by spreaders.
Claim	State FDA: 60% of the drugs will be stopped selling within 2 or 3 years and will be replaced by nutraceutical industry. State will invest 8 trillion!
Key Sentences	
KS1.	It's been reported that FDA has proposed that 60% of the drugs will be stopped selling within the next 2 or 3 years and replaced by nutraceuticals and foods.
KS2.	The reporter visited the website of the FDA but found no such official documents, indicating the details in the claim were purely fabricated.
KS3.	It's verified that the claim that nutraceuticals will replace drugs is a malicious propaganda by companies to confuse the netizens.

Attention Visualization on Posts

Sentence-level Debunking Display

ACL'21 “Important problem” Qiang Sheng et al. Article Reranking by Memory-enhanced Key Sentence Matching for Detecting Previously Fact-checked Claims.

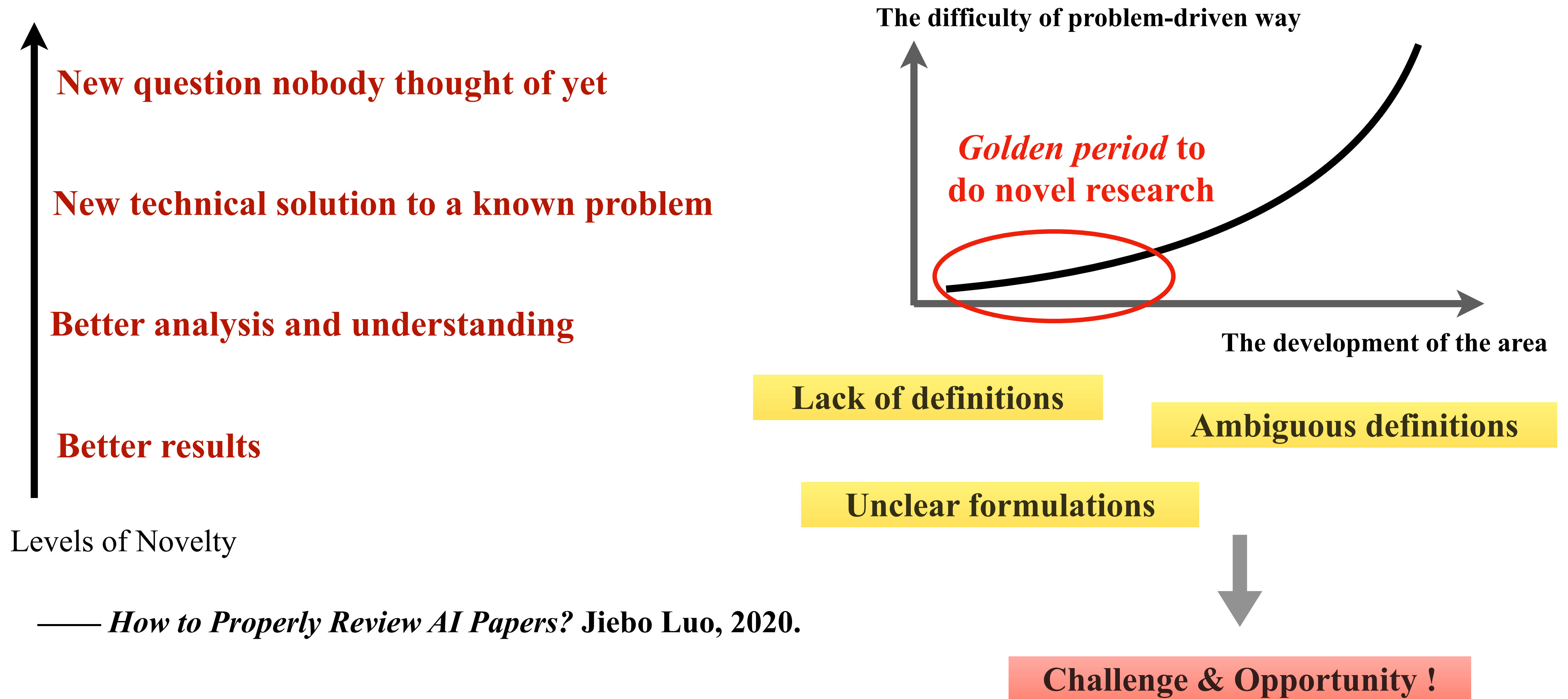
Case3: Move on to the lifecycle of fake news detection



ACL'22 “Interesting idea”, “Easy to understand”
Environment Perception for Fake News Detection.

Qiang Sheng et al. Zoom Out and Observe: News

Problem-driven will be harder and harder for an area!

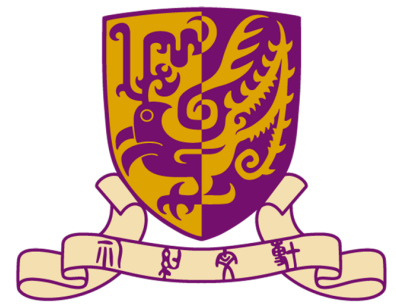


Suggestions of our future research

- **Attach importance to interdiscipline**
 - Follow its **development** and summarize its **history** (in general is enough).
 - Focus on the newly proposed **formulation**.
- **Back to the real application scene**
 - See more real data. Pay attention to the **industry application**.
- **Trace back the historic and classical researches**
 - Mine more golds in the giants' researches.
 - Tips: think through their *Challenges* sections

References

- Michael J. Black. [Novelty in Science — A guide for reviewers.](#)
- 李沐. [如何判断（你自己的）研究工作的价值.](#)
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- 沈向洋, 华刚. [读科研论文的三个层次、四个阶段与十个问题.](#)
- 知乎问题. [AI论文中的novelty如何评价? .](#)



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Thanks