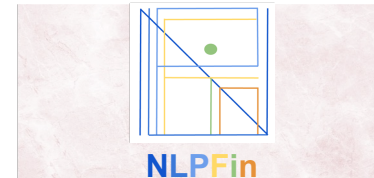# FinArg-2:
# Temporal Inference of Financial Arguments

**Chung-Chi Chen**, AIRC, AIST, Japan

Hen-Hsen Huang, Institute of Information Science, Academia Sinica, Taiwan

Hsin-Hsi Chen, Department of Computer Science and Information Engineering, National Taiwan University

Hiroya Takamura, AIRC, AIST, Japan

Yu-Lieh Huang, Department of Quantitative Finance, National Tsing Hua University
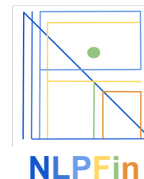
Alaa Alhamzeh, Department of Computer Sciences, University of Passau

http://finarg.nlpfin.com/

# Overview of FinArg Task Series

| Short Name | Language | Source | Task |
|---|---|---|---|
| FinArg-1 | English | Analyst Report | Argument-based Sentiment Analysis |
| | English | Earnings Call | Argument Unit/Relation Identification |
| | Chinese | Social Media | Identifying Attack and Support Argumentative Relations in Social Media Discussion Thread |
| FinArg-2 | English | Analyst Report | Premise's Influence Period Assessment |
| | English | Earnings Calls | Argument Temporal Reference Detection |
| | Chinese | Social Media | Claim's Validity Period Assessment |
| FinArg-3 | English | Analyst Report | High Forecasting Skill Report Retrieval |
| | English | Earnings Calls | Argument Quality Assessment |
| | Chinese | Social Media | High Forecasting Skill Opinion Retrieval |

**References:**
[1] Chen, Chung-Chi, Hen-Hsen Huang, and Hsin-Hsi Chen. "Evaluating the rationales of amateur investors." Proceedings of the Web Conference. 2021
[2] Alhamzeh, A., Fonck, R., Versmée, E., Egyed-Zsigmond, E., Kosch, H., & Brunie, L. "It's Time to Reason: Annotating Argumentation Structures in Financial Earnings Calls: The FinArg Dataset." FinNLP-2022
[3] Ramon Ruiz-Dolz, Chr-Jr Chiu, Chung-Chi Chen, Noriko Kando, Hsin-Hsi Chen. Learning Strategies for Robust Argument Mining: An Analysis of Variations in Language and Domain. LREC-COLING-2024
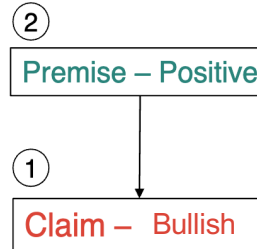
# Task and Dataset

# Professional Stock Research Report

Overall, we're pleased with the execution and momentum. *The fourth quarter is underway, and we are offering easy access to great products at excellent value heading into this holiday season, both in our stores and online.* For the 13-week period ending January 26, 2018, we expect comp sales to increase between 1.5% and 2% on a more difficult comparison.

② Premise – Positive

① Claim – Bullish

## Given a premise, infer the impact duration of it. (Future)

| Duration Label | Training | Development | Test |
|---|---|---|---|
| <1 month | 655 | 73 | 41 |
| 1-3 month | 5,258 | 584 | 1,044 |
| 4-6 month | 3,589 | 399 | 457 |
| 7-12 month | 9,004 | 1,000 | 2,121 |
| >1 year | 5,511 | 612 | 1,308 |

# Social Media Discussion Thread

## Original Post

TSM's PE ratio is actually only 15.7~17.4 times!!!
Folks, let me tell you more numbers to let you know that TSM is not expensive:
1. The historical average range of stock market PE ratio is 15~20.
2. The current P/E ratio of stocks is about 16-17.
3. The current P/E ratio of semiconductor stocks is about 23 to 24 times.
After 5 nanometers have also come out, it's not too much to earn 5 yuan a season, right? The EPS will easily be 20 in one year.

The stock price goes up to 500 in 3 to 5 years!

### R1

I agree, I have bought TSMC for a long time, this is already a belief — **Support**

### R2

It should be a reasonable estimate that eps is close to 20 yuan after three years — **Support**

### R3

This time, some electronics factories have cut orders to transfer orders. SMIC has the support of the national team. All countries, large and small factories, will be a threat to TSM, and I don't think it will increase 500 in the future. — **Attack**

### R4

It only doubles in 3~5 years. When the big crash is full of cheap premium stocks, the risk is not proportional to the recovery. — **Attack**

## Given a claim, infer the valid period of it. (Future)

|  | Positive | Neutral | Negative | Total |
|---|---|---|---|---|
| Longer than 1 week | 3,686 | 713 | 1,709 | 6,108 |
| Within 1 week | 851 | 365 | 731 | 1,947 |
| Unsure | 350 | 98 | 257 | 705 |
| Total | 4,887 | 1,176 | 2,697 | 8,760 |

# Earnings Conference Call

**Company Manager**

**Apple Inc. (NASDAQ:AAPL) Q1 2024 Earnings Call Transcript**

Revenue for the December quarter was $119.6 billion, up 2% from last year.
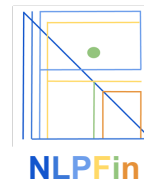
**Within this Quarter**

## Given an argument, identify the temporal tag. (Past)

| Period | |
| --- | --- |
| Within this Quarter | 150 |
| Up to Two Quarter | 93 |
| Half to one Year | 114 |
| More than one Year | 60 |
| Not Mentioned | 1,767 |

**Professional Analysts**

# Why FinArg-2 Tasks are Important?

# Professional Stock Research Report

- Improving Forecasting Skill Assessment from Text

|  | Feature | Accuracy | Precision | Recall | F1 Score |
|---|---|---|---|---|---|
| Longformer | - | 0.705 | 0.723 | 0.705 | 0.699 |
| GNN | - | 0.731 | 0.732 | 0.731 | 0.728 |
| | Impact Duration | 0.757 | 0.756 | 0.757 | 0.757 |

| Short Name | Language | Source | Task |
|---|---|---|---|
| FinArg-1 | English | Analyst Report | Argument-based Sentiment Analysis |
| | English | Earnings Call | Argument Unit/Relation Identification |
| | Chinese | Social Media | Identifying Attack and Support Argumentative Relations in Social Media Discussion Thread |
| FinArg-2 | English | Analyst Report | Premise's Influence Period Assessment |
| | English | Earnings Calls | Argument Temporal Reference Detection |
| | Chinese | Social Media | Claim's Validity Period Assessment |
| FinArg-3 | English | Analyst Report | High Forecasting Skill Report Retrieval |
| | English | Earnings Calls | Argument Quality Assessment |
| | Chinese | Social Media | High Forecasting Skill Opinion Retrieval |

# Social Media Discussion Thread

- Improving the Performance on Stock Movement Prediction based on Text

| Type | Model | Accuracy | F1 |
|------|-------|----------|-----|
| PLM | BERT-Chinese | 58.36% | 58.33% |
| | Multilingual-BERT | 58.36% | 58.16% |
| | Chinese-BERT | 60.32% | 60.33% |
| | Mengzi-BERT | 59.72% | 59.70% |
| | Mengzi-BERT-Fin | 57.61% | 57.44% |
| Proposed | IDED-BERT | 63.17% | 62.92% |
| | IDED-mBERT | 62.90% | 62.84% |
| | IDED-CBERT | 61.68% | 61.36% |
| | IDED-Mengzi | 64.05% | 64.09% |
| | IDED-Mengzi-Fin | **64.18%** | **64.15%** |

# FinArg-2: Temporal Inference of Financial Arguments

NLPFin

- **Professional Stock Research Report (31,656 instances)**

  - **Given a premise, infer the impact duration of it. (Future)**

| Duration Label | Training | Development | Test |
|---|---|---|---|
| <1 month | 655 | 73 | 41 |
| 1-3 month | 5,258 | 584 | 1,044 |
| 4-6 month | 3,589 | 399 | 457 |
| 7-12 month | 9,004 | 1,000 | 2,121 |
| >1 year | 5,511 | 612 | 1,308 |

→ Useful for Forecasting Skill Analysis (FinArg-3)

- **Social Media Post (8,760 instances)**

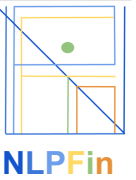  - **Given a claim, infer the valid period of it. (Future)**

| | Positive | Neutral | Negative | Total |
|---|---|---|---|---|
| Longer than 1 week | 3,686 | 713 | 1,709 | 6,108 |
| Within 1 week | 851 | 365 | 731 | 1,947 |
| Unsure | 350 | 98 | 257 | 705 |
| Total | 4,887 | 1,176 | 2,697 | 8,760 |

→ Useful for Stock Movement Prediction

- **Earnings Conference Call (2,184 instances)**

  - **Given an argument, identify the temporal tag. (Past)**

| Period | |
|---|---|
| Within this Quarter | 150 |
| Up to Two Quarter | 93 |
| Half to one Year | 114 |
| More than one Year | 60 |
| Not Mentioned | 1,767 |

10

# Related Events

- **FinNLP-AgentScen Workshop @ IJCAI-2024 – August 3 – 9 – Jeju, South Korea**
  - Joint Workshop of the 8th Financial Technology and Natural Language Processing (FinNLP) and the 1st Agent AI for Scenario Planning (AgentScen)
  - Main Track Submission Deadline: April 26th.
  - Shared Tasks
    - Multiple Question Generation from Presentation Transcripts (MQG)
    - Forward-Looking Document Comment Generation (DCG)
    - Financial Large Language Model Evaluation (FinLLM)
  - https://sites.google.com/nlg.csie.ntu.edu.tw/finnlp-agentscen/home

- **The 17th International Natural Language Generation Conference (INLG) – September 23 - 27 – AIST, Tokyo, Japan**
  - https://inlg2024.github.io/

- **Join us if you also attend**
  - NumEval: Numeral-Aware Language Understanding and Generation (NumEval) @ SemEval (NAACL)
  - FinNLP-KDF-ECONLP Workshop @ LREC-COLING
    - Two Invited Talks
    - 20 Main Track Papers
    - Two shared Tasks
    - https://sites.google.com/nlg.csie.ntu.edu.tw/finnlp-kdf-2024/home