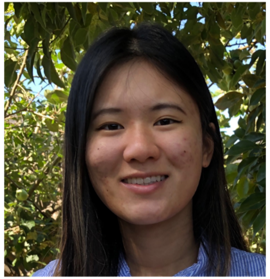
NewsCLIPpings

Automatic Generation of Out-of-Context Multimodal Media

Grace Luo, Trevor Darrell, Anna Rohrbach

University of California, Berkeley

BAIR

BERKELEY ARTIFICIAL INTELLIGENCE RESEARCH

Motivation: Out-of-Context Images

Motivation: Out-of-Context Images

UNELECTED **House of Lords** told to stop FALLING ASLEEP.

EXPRESS

Legitimate old photograph

Motivation: Out-of-Context Images

UNELECTED **House of Lords** told to stop FALLING ASLEEP.

EXPRESS

Legitimate old photograph

$85/hr is too much to pay our **senators** to literally do nothing.

Evidence of recent events

BAIR

BERKELEY ARTIFICIAL INTELLIGENCE RESEARCH

Motivation: Out-of-Context Images

UNELECTED **House of Lords** told to stop FALLING ASLEEP.

EXPRESS

Legitimate old photograph

$85/hr is too much to pay our **senators** to literally do nothing.

Evidence of recent events

Motivation: Out-of-Context Images

UNELECTED **House of Lords** told to stop FALLING ASLEEP.

EXPRESS

Legitimate old photograph

$85/hr is too much to pay our **senators** to literally do nothing.

Evidence of recent events

Alert! Automation of cheapfakes.

Prior Out-of-Context Datasets

Dataset	Method	Notes
MAIM (Jaiswal et al, 2017)	Random	Little text-image alignment
TamperedNews (Muller-Budack et al, 2020)	Text entity manipulation	Linguistic biases
COSMOS (Aneja et al, 2021)	Human generated	Small number of labelled samples
NewsCLIPpings (Ours)	Automatic retrieval	Convincing to humans No linguistic biases Almost 1M labelled samples

BAIR
BERKELEY ARTIFICIAL INTELLIGENCE RESEARCH

Prior Out-of-Context Datasets

Dataset	Method	Notes
MAIM (Jaiswal et al, 2017)	Random	Little text-image alignment
TamperedNews (Muller-Budack et al, 2020)	Text entity manipulation	Linguistic biases
COSMOS (Aneja et al, 2021)	Human generated	Small number of labelled samples
NewsCLIPpings (Ours)	Automatic retrieval	Convincing to humans No linguistic biases Almost 1M labelled samples

BAIR
BERKELEY ARTIFICIAL INTELLIGENCE RESEARCH

Prior Out-of-Context Datasets

Dataset	Method	Notes
MAIM (Jaiswal et al, 2017)	Random	Little text-image alignment
TamperedNews (Muller-Budack et al, 2020)	Text entity manipulation	Linguistic biases
COSMOS (Aneja et al, 2021)	Human generated	Small number of labelled samples
NewsCLIPpings (Ours)	Automatic retrieval	Convincing to humans No linguistic biases Almost 1M labelled samples

BAIR
BERKELEY ARTIFICIAL INTELLIGENCE RESEARCH

Prior Out-of-Context Datasets

Dataset	Method	Notes
MAIM (Jaiswal et al, 2017)	Random	Little text-image alignment
TamperedNews (Muller-Budack et al, 2020)	Text entity manipulation	Linguistic biases
COSMOS (Aneja et al, 2021)	Human generated	Small number of labelled samples
NewsCLIPpings (Ours)	Automatic retrieval	Convincing to humans No linguistic biases Almost 1M labelled samples

NewsCLIPpings Dataset Overview

- Dataset of ~1M samples of **news image repurposing**.
- Diagnostic benchmark for **machine generated misinformation.**
- General automatic framework for generating **challenging mismatches**.

Fuxiao Liu, Yinghan Wang, Tianlu Wang, and Vicente Ordonez. 2020. Visualnews: A large multi-source news image dataset. EMNLP 2021.

Approach

“Angela Merkel speaks”

Pool of candidate images

Scoring

Filtering

Angela Merkel speaks

Approach

✓ Semantics

✓ Person

✓ Scene

Approach: In-the-Wild

Photo shows U.S. Sen. Tom Cotton of Arkansas sitting on a bed of gold bars…

✓ Semantics
X NE

✓ Person
X Semantics

✓ Scene
X NE

BAIR
BERKELEY ARTIFICIAL INTELLIGENCE RESEARCH

Approach: In-the-Wild

Photo shows U.S. Sen. Tom Cotton of Arkansas sitting on a bed of gold bars...

✓ Semantics
X NE

✓ Person
X Semantics

✓ Scene
X NE

Approach: In-the-Wild

Photo shows U.S. Sen. Tom Cotton of Arkansas sitting on a bed of gold bars…

✓ Semantics
X NE

✓ Person
X Semantics

✓ Scene
X NE

Approach: NewsCLIPpings

Angela Merkel speaks to the German parliament…

✓ Semantics
X NE

✓ Person
X Semantics

✓ Scene
X NE

Approach: NewsCLIPpings

Angela Merkel speaks to the German parliament…

✓ Semantics
X NE

✓ Person
X Semantics

✓ Scene
X NE

Approach: NewsCLIPpings

Angela Merkel speaks to the German parliament...

✓ Semantics
X NE

✓ Person
X Semantics

✓ Scene
X NE

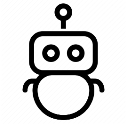
Approach: NewsCLIPpings

Semantics CLIP Text-Image

Approach: NewsCLIPpings

Semantics CLIP Text-Image

Angela Merkel speaks
to the German parliament…



Approach: NewsCLIPpings

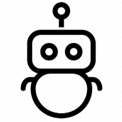
Semantics CLIP Text-Image

CTI Sim: 0.2940

CTI Sim. 0.2799

CTI Sim. 0.2114

Angela Merkel speaks
to the German parliament…



Approach: NewsCLIPpings

Semantics CLIP Text-Image

CTI Sim: 0.2940

CTI Sim. 0.2799

CTI Sim. 0.2114

Falsified

Angela Merkel speaks
to the German parliament…

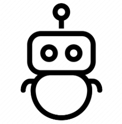
Angela Merkel speaks
to the German parliament…

BAIR
BERKELEY ARTIFICIAL INTELLIGENCE RESEARCH

Approach: NewsCLIPpings

Semantics CLIP Text-Text

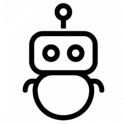
Angela Merkel speaks
to the German parliament…



Approach: NewsCLIPpings

Semantics CLIP Text-Text

Angela Merkel speaks
to the German parliament…



Ingeborg Berggreen Merkel delivers the task force s report in Berlin.
CTT Sim. 0.8006

Half of Tessa Jowell s settlement will go direct to a charity in her south London constituency.
CTT Sim. 0.5467

Tennessee Gov Bill Haslam delivers his State of the State address to a joint session of the General Assembly on Monday in Nashville.
CTT Sim.: 0.4942

Approach: NewsCLIPpings

Semantics CLIP Text-Text

Ingeborg Berggreen Merkel delivers the task force s report in Berlin.
CTT Sim. 0.8006

Half of Tessa Jowell s settlement will go direct to a charity in her south London constituency.
CTT Sim. 0.5467

Tennessee Gov Bill Haslam delivers his State of the State address to a joint session of the General Assembly on Monday in Nashville.
CTT Sim.: 0.4942

Falsified

Angela Merkel speaks to the German parliament…

Angela Merkel speaks to the German parliament…

Approach: In-the-Wild

Photo shows Tampa Mayor Jane Castor maskless at Super Bowl.

✓ Semantics
X NE

✓ Person
X Semantics

✓ Scene
X NE

Approach: In-the-Wild

Photo shows Tampa Mayor Jane Castor maskless at Super Bowl.

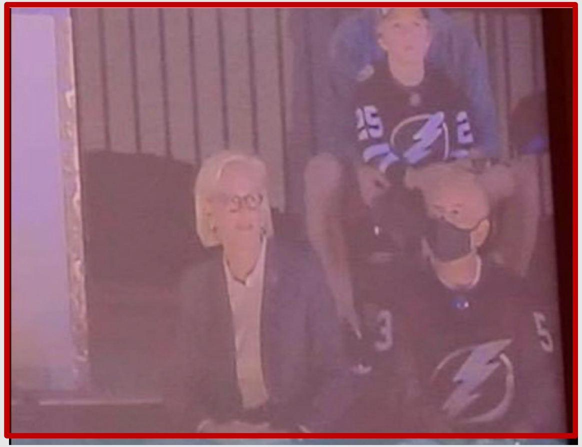
✓ Semantics
X NE

✓ Person
X Semantics

✓ Scene
X NE

Approach: In-the-Wild

Photo shows Tampa Mayor Jane Castor maskless at Super Bowl.



✓ Semantics
X NE

✓ Person
X Semantics

✓ Scene
X NE

Approach: NewsCLIPpings

Prince William and Duchess Kate introduce their son to the world.

✓ Semantics
X NE

✓ Person
X Semantics

✓ Scene
X NE

Approach: NewsCLIPpings

Prince William and Duchess Kate introduce their son to the world.

✓ Semantics
X NE

✓ Person
X Semantics

✓ Scene
X NE

BAIR
BERKELEY ARTIFICIAL INTELLIGENCE RESEARCH

Approach: NewsCLIPpings

Prince William and Duchess Kate introduce their son to the world.

✓ Semantics
X NE

✓ Person
X Semantics

✓ Scene
X NE

Approach: NewsCLIPpings

Person SBERT-WK Text-Text

Approach: NewsCLIPpings

Person SBERT-WK Text-Text

Prince William and Duchess Kate introduce their son to the world.

Approach: NewsCLIPpings

Person SBERT-WK Text-Text

Prince William the Duke of Cambridge carries his newborn baby boy to the car after leaving the hospital.
STT Sim. 0.8753

William Catherine and Harry attend the forum.
STT Sim. 0.8480

Prince William missed the net this summer at the Somba K e Civic Plaza Yellowknife.
STT Sim. 0.7854

Prince William and Duchess Kate introduce their son to the world.

Approach: NewsCLIPpings

Person SBERT-WK Text-Text

Prince William and Duchess Kate introduce their son to the world.

Prince William the Duke of Cambridge carries his newborn baby boy to the car after leaving the hospital.
STT Sim. 0.8753

William Catherine and Harry attend the forum.
STT Sim. 0.8480

Prince William missed the net this summer at the Somba K e Civic Plaza Yellowknife.
STT Sim. 0.7854

Falsified

Prince William and Duchess Kate introduce their son to the world.

Approach: In-the-Wild

… trash that was left behind by … refugees traveling … to the United States

✓ Semantics
X NE

✓ Person
X Semantics

✓ Scene
X NE

BAIR
BERKELEY ARTIFICIAL INTELLIGENCE RESEARCH

Approach: In-the-Wild

… trash that was left behind by … refugees traveling … to the United States

✓ Semantics
X NE

✓ Person
X Semantics

✓ Scene
X NE

Approach: In-the-Wild

… trash that was left behind by … refugees traveling … to the United States

✓ Semantics
X NE

✓ Person
X Semantics

✓ Scene
X NE

Approach: NewsCLIPpings

Fukushima Daiichi nuclear power plant after Japan s earthquake and tsunami…

✓ Semantics
X NE

✓ Person
X Semantics

✓ Scene
X NE

Approach: NewsCLIPpings

Fukushima Daiichi nuclear power plant after Japan s earthquake and tsunami…

✓ Semantics
X NE

✓ Person
X Semantics

✓ Scene
X NE

Approach: NewsCLIPpings

Fukushima Daiichi nuclear power plant after Japan s earthquake and tsunami...

✓ Semantics
X NE

✓ Person
X Semantics

✓ Scene
X NE

Approach: NewsCLIPpings

Scene ResNet Place

Approach: NewsCLIPpings

Scene ResNet Place

Approach: NewsCLIPpings

Scene ResNet Place

RP Sim. 0.8272

RP Sim. 0.7829

RP Sim. 0.7823

Approach: NewsCLIPpings

Scene ResNet Place

RP Sim. 0.8272

RP Sim. 0.7829

RP Sim. 0.7823

Falsified

Fukushima Daiichi nuclear power plant after Japan s earthquake and tsunami in March.

Approach

✓ Semantics
CLIP Text-Image, CLIP Text-Text

✓ Person
SBERT-WK Text-Text

✓ Scene
ResNet Place

Approach

✓ **Semantics**

CLIP Text-Image, CLIP Text-Text

✓ **Person**

SBERT-WK Text-Text

✓ **Scene**

ResNet Place

Approach

✓ Semantics
CLIP Text-Image, CLIP Text-Text

✓ Person
SBERT-WK Text-Text

✓ Scene
ResNet Place

Approach

✓ Semantics

CLIP Text-Image, CLIP Text-Text

✓ Person

SBERT-WK Text-Text

✓ **Scene**

ResNet Place

Experimental Setup

- Binary classification: pristine or falsified

Pristine or Falsified?

The fire at the Darul Uloom school…

Note that we exclude samples in the NewsCLIPping val / test sets across all splits for the VisualNews pretraining dataset.

Experimental Setup

- Binary classification: pristine or falsified
- Balanced wrt captions, labels

Pristine or Falsified?

The fire at the Darul Uloom school…

Note that we exclude samples in the NewsCLIPping val / test sets across all splits for the VisualNews pretraining dataset.

Experimental Setup

- Binary classification: pristine or falsified
- Balanced wrt captions, labels

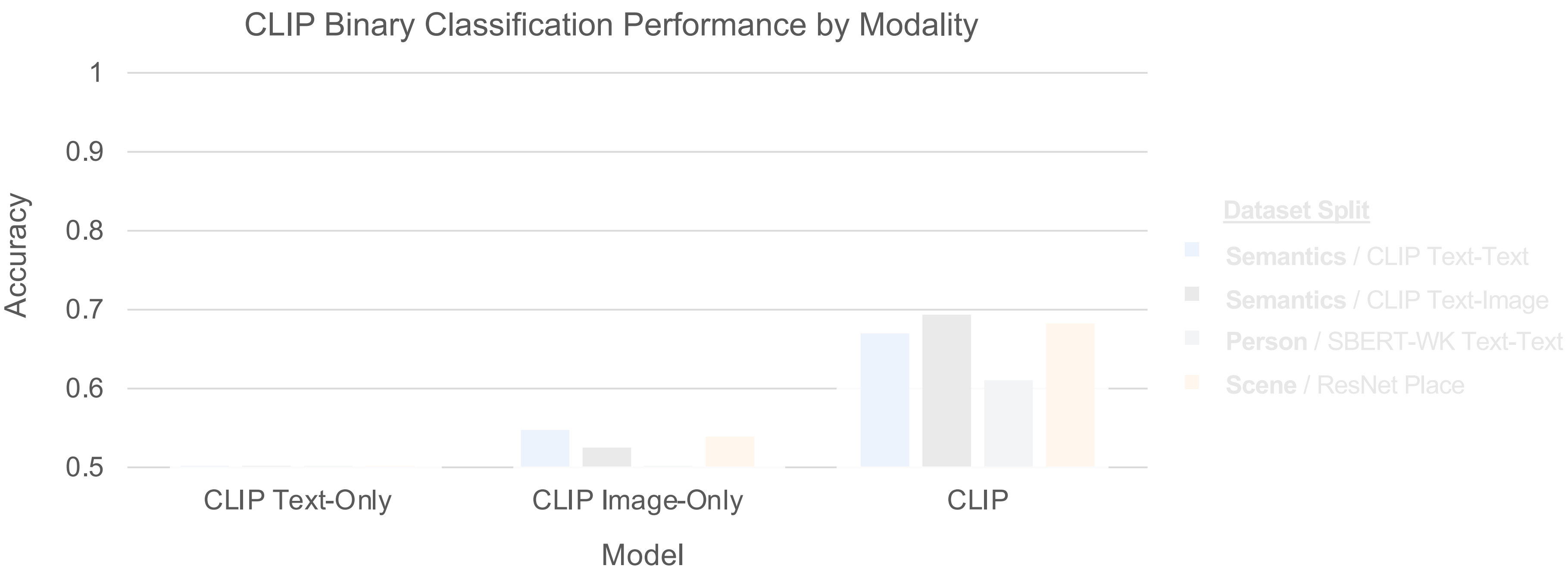
- **CLIP** (Radford et al., 2021): pretrained on 400M web corpus
- **VisualBERT** (Li et al., 2019): pretrained on 3M Conceptual Captions (Sharma et al., 2018) or 1M VisualNews (Liu et al., 2020)

Pristine or Falsified?

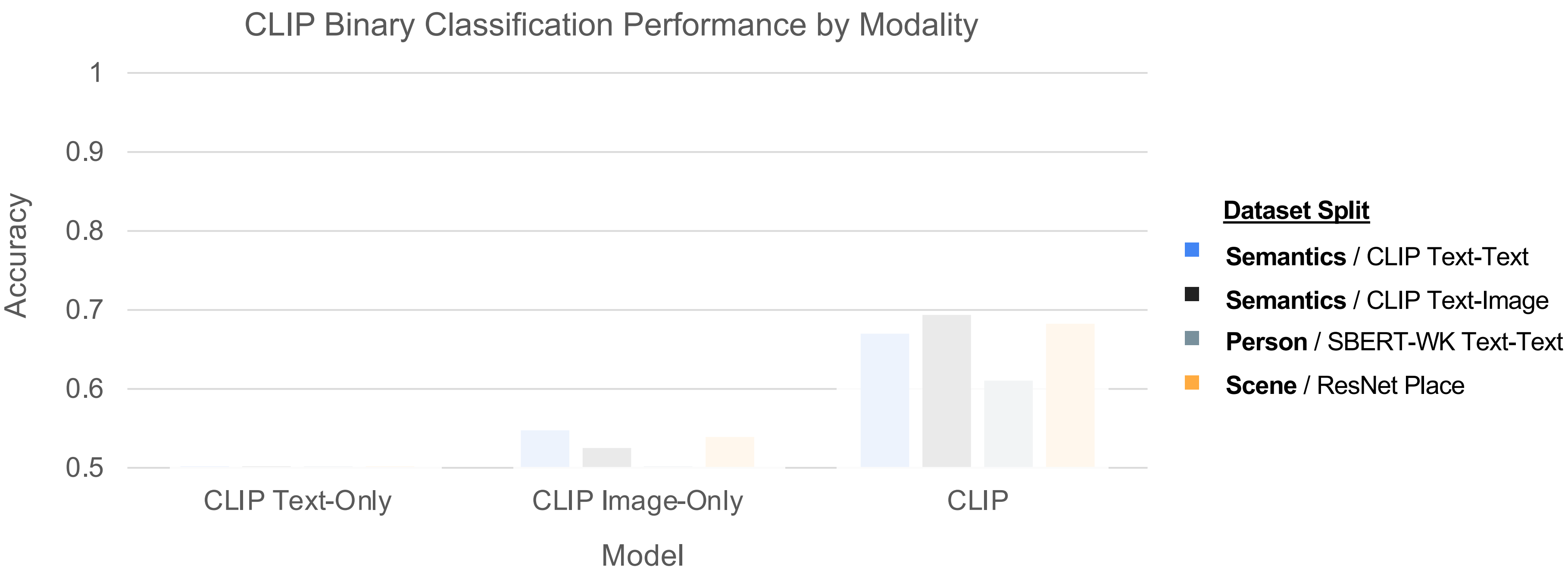
The fire at the Darul Uloom school…

Note that we exclude samples in the NewsCLIPping val / test sets across all splits for the VisualNews pretraining dataset.

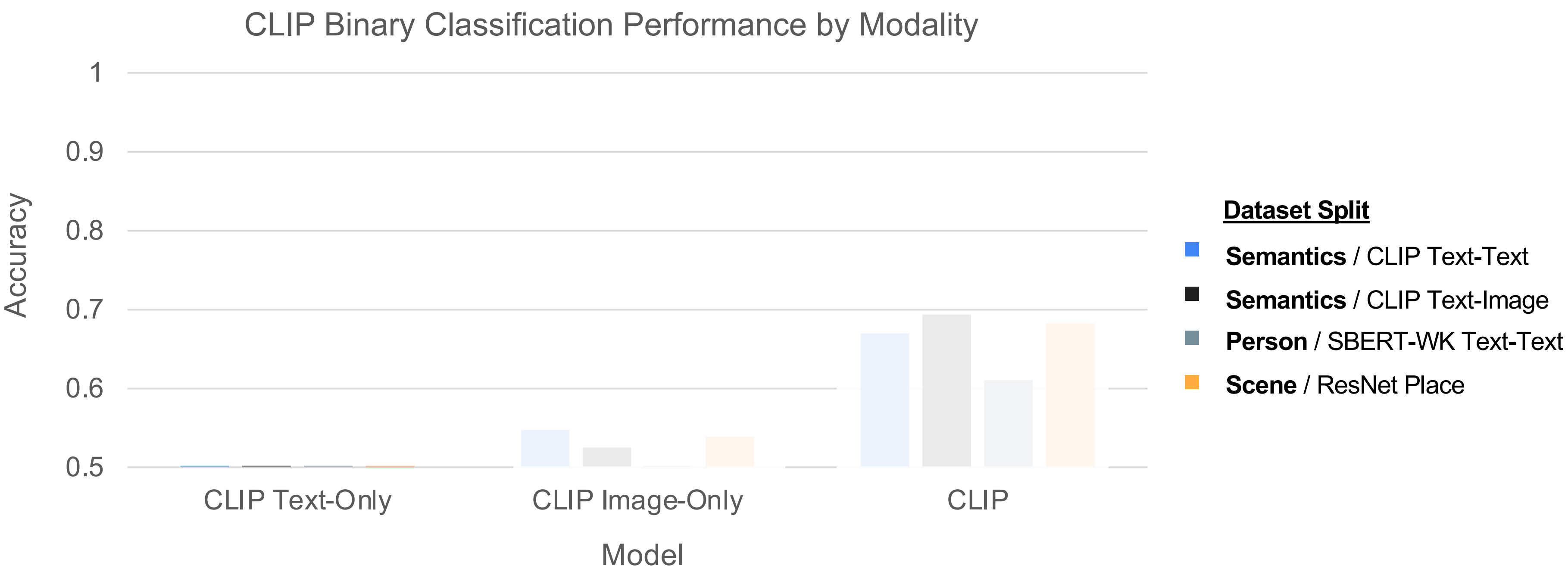
Experiments: Unimodal vs Multimodal



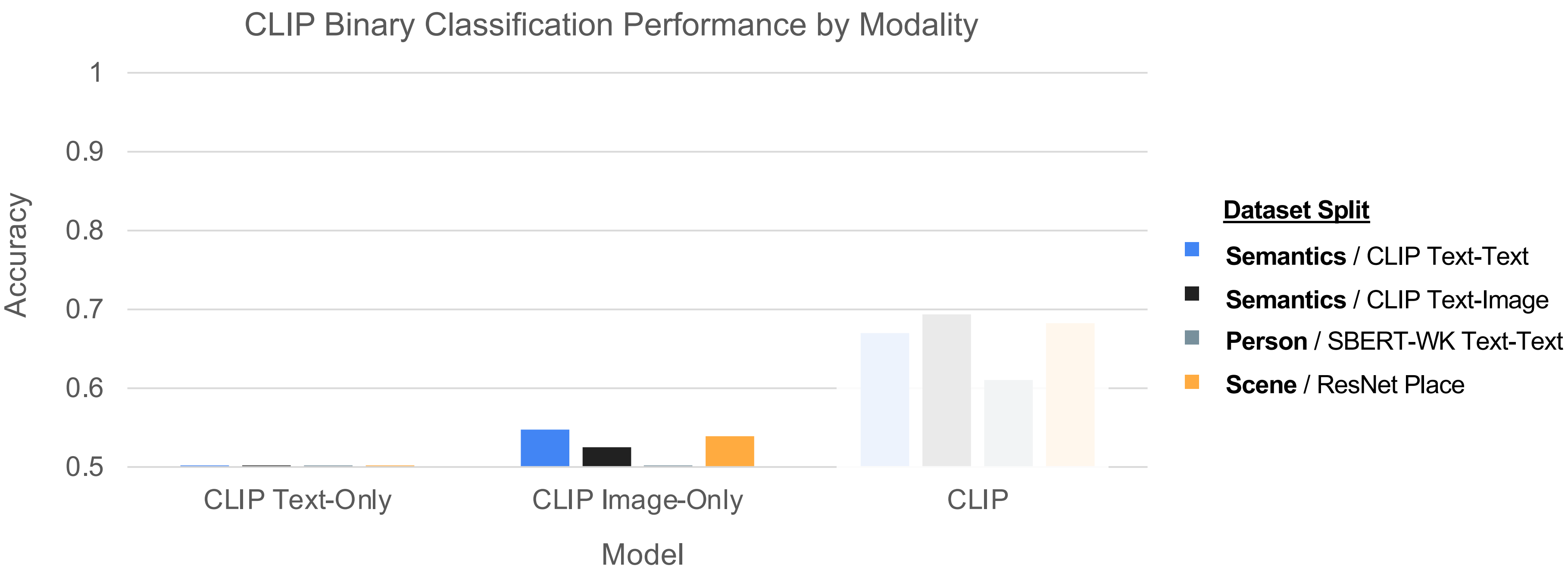
Experiments: Unimodal vs Multimodal



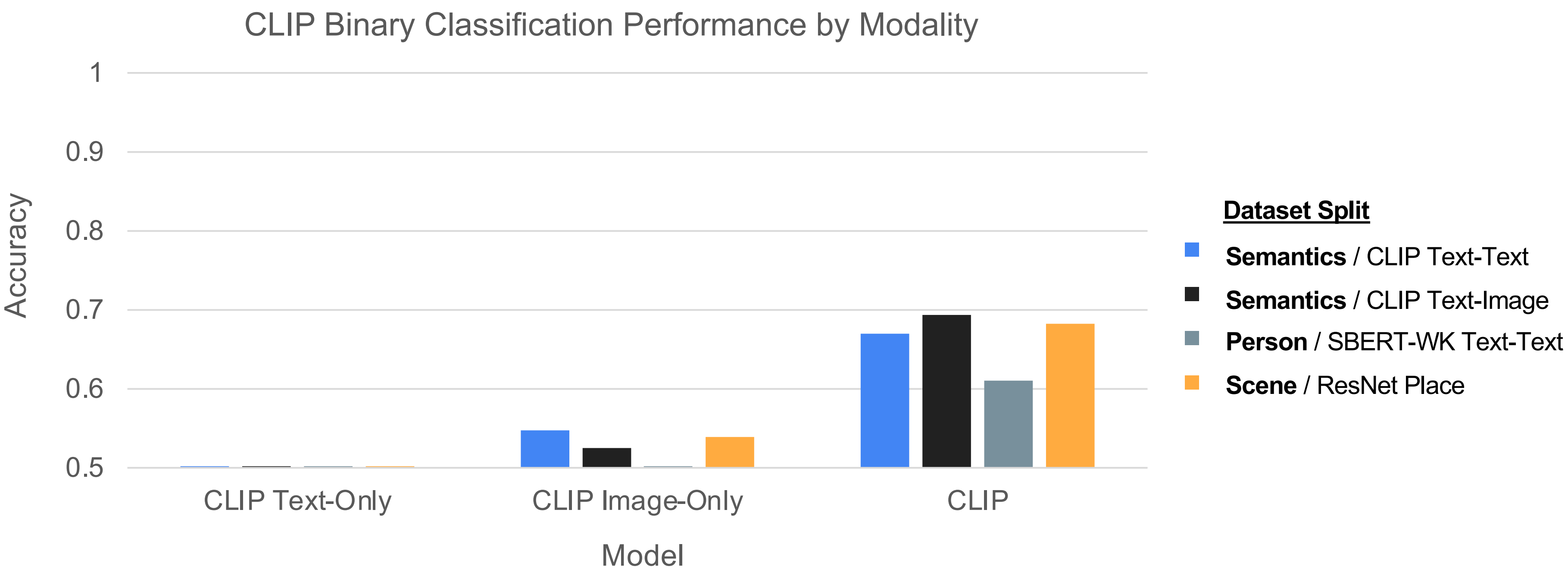
Experiments: Unimodal vs Multimodal



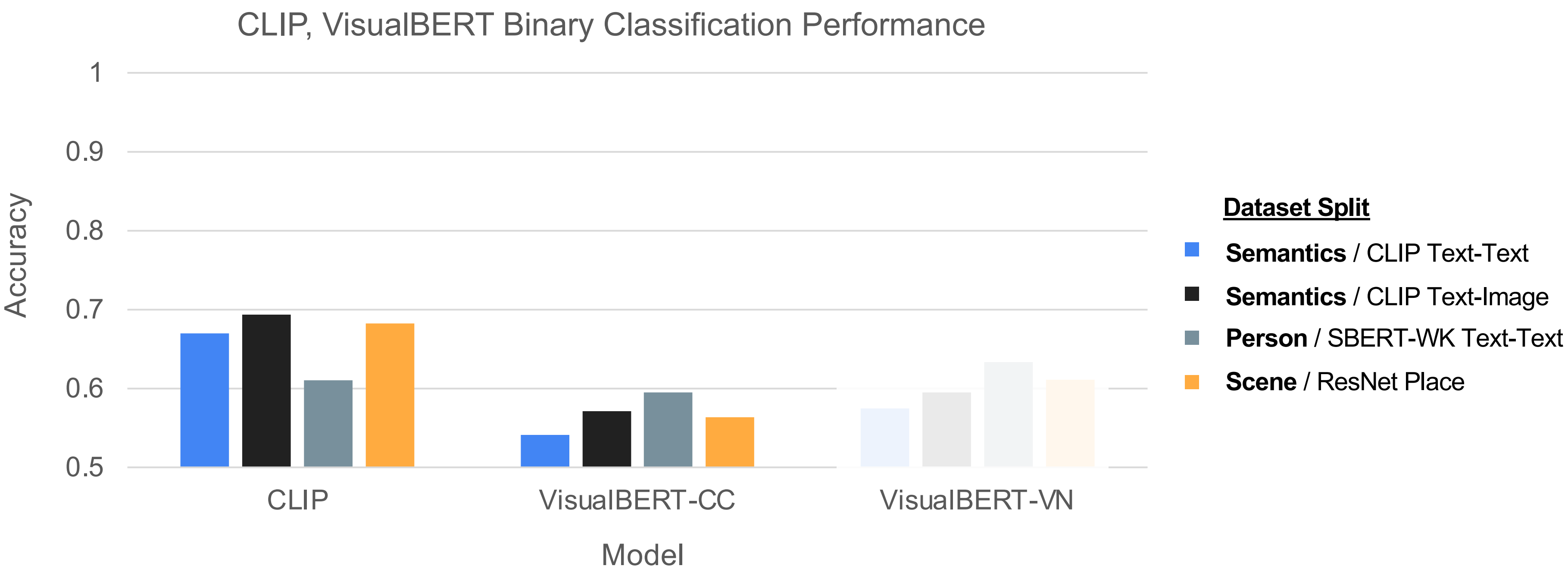
Experiments: Unimodal vs Multimodal



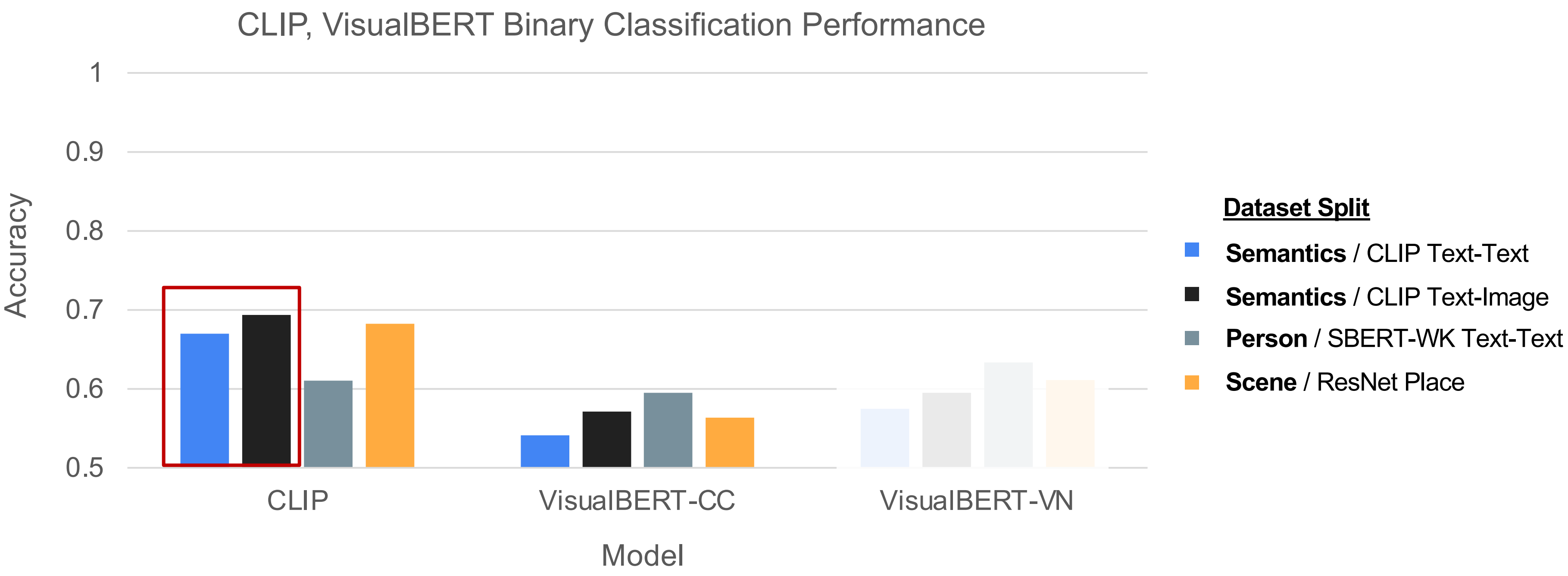
Experiments: Unimodal vs Multimodal



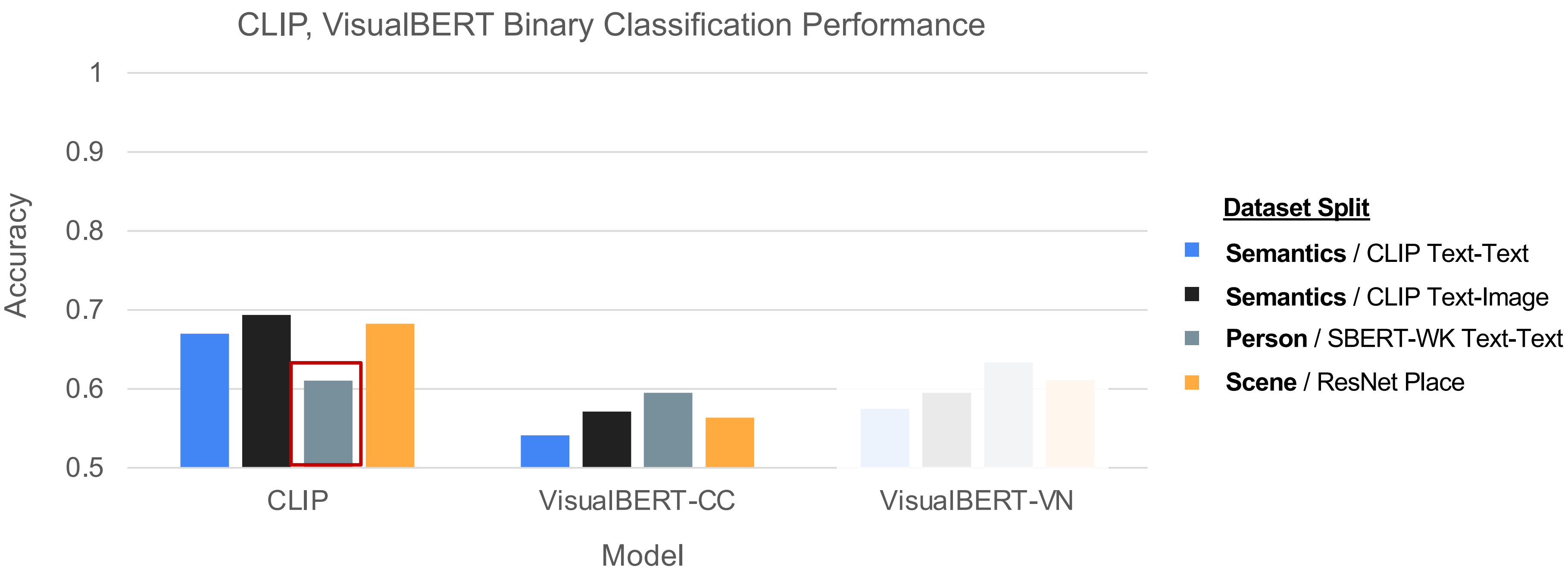
Experiments: Multimodal



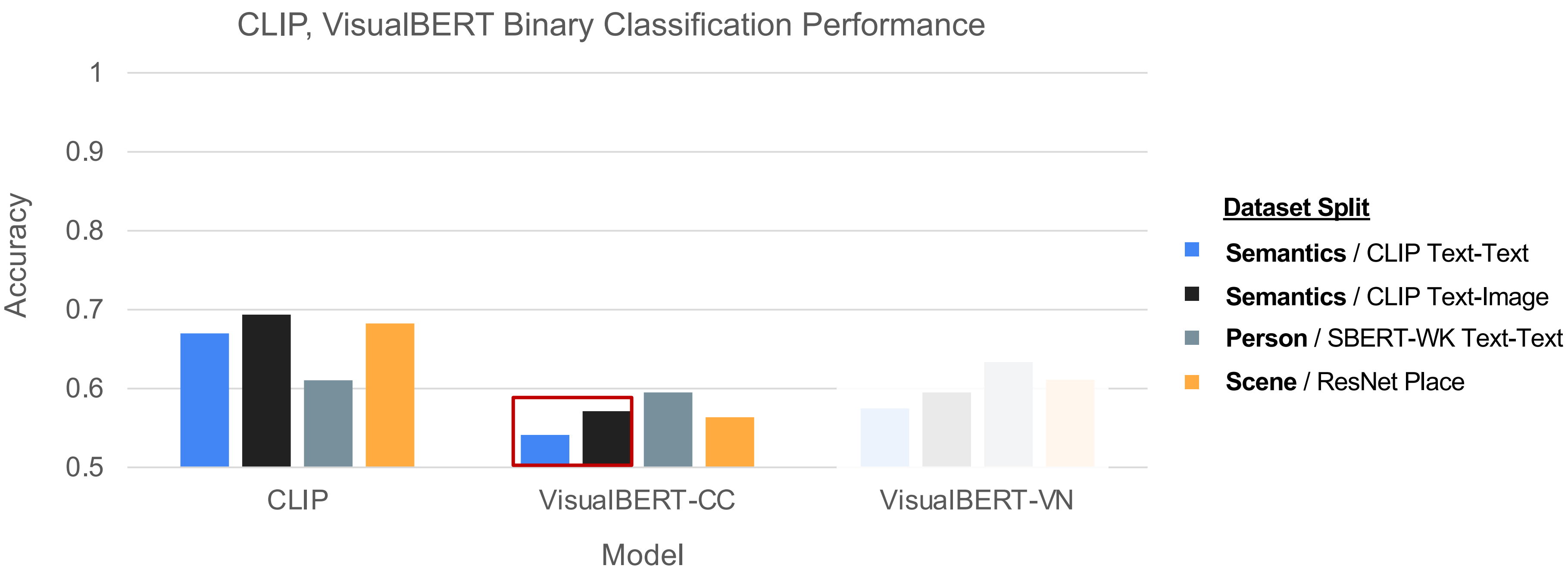
Experiments: Multimodal



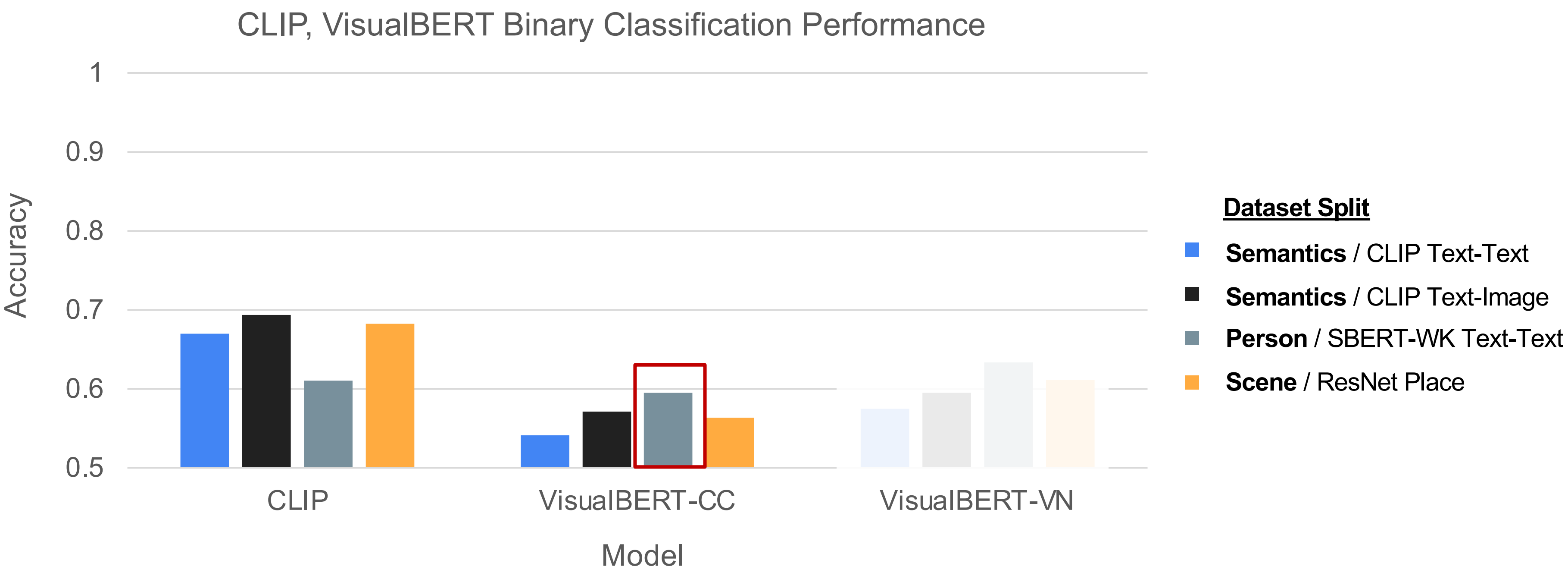
Experiments: Multimodal



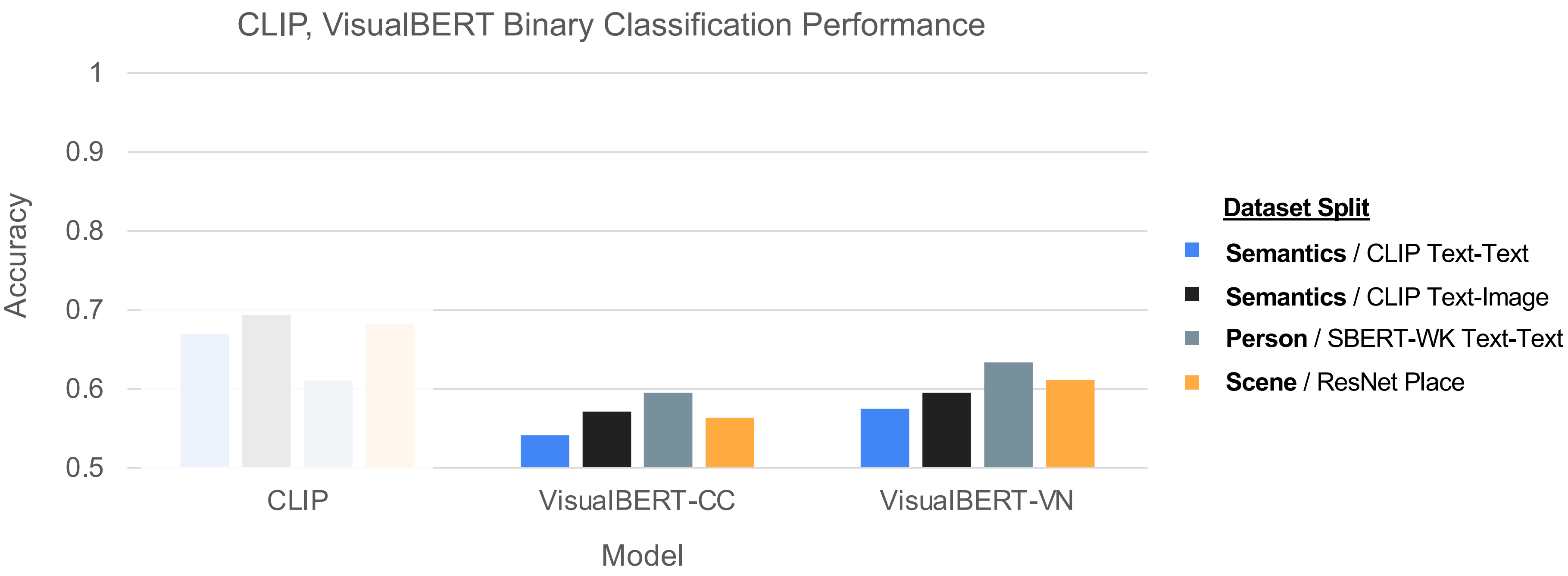
Experiments: Multimodal



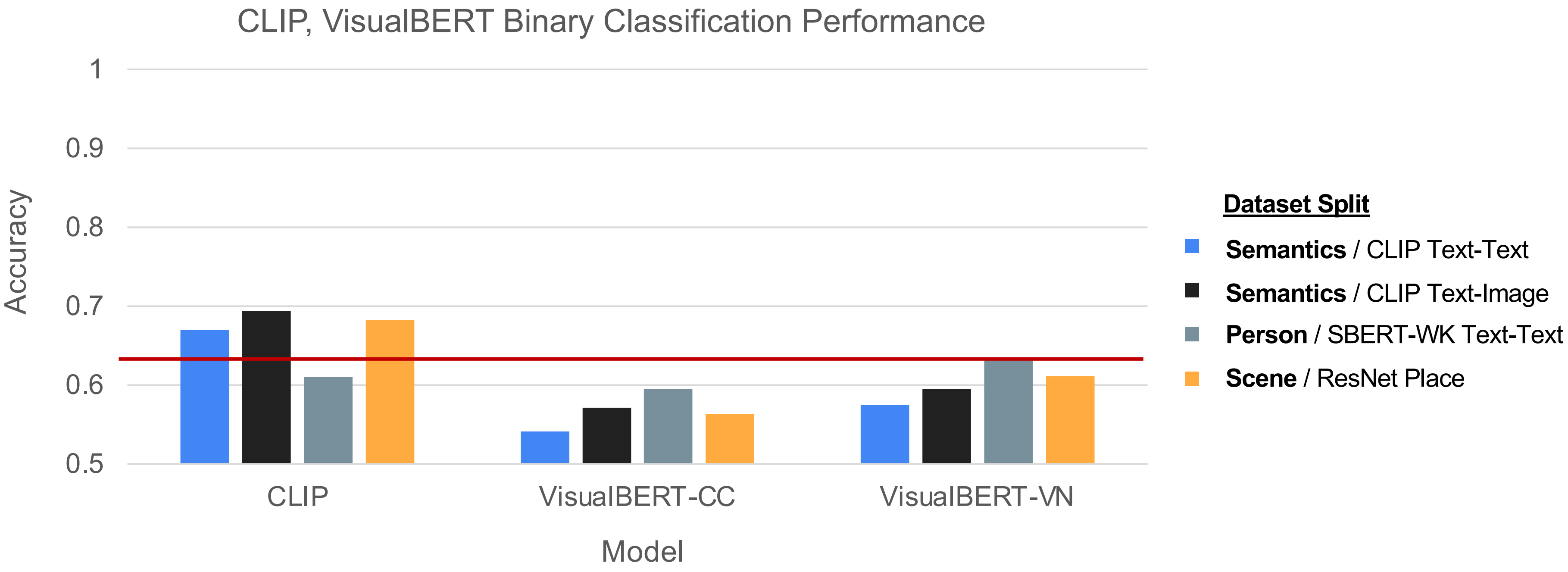
Experiments: Multimodal



Experiments: Multimodal



Experiments: Multimodal



Human Evaluation

- Same binary classification task

Does the image belong to the given caption?

The fire at the Darul Uloom school…

BAIR
BERKELEY ARTIFICIAL INTELLIGENCE RESEARCH

Human Evaluation

- Same binary classification task
- 100 sample subset
  - ~25% from each split
  - ~50% pristine, falsified

Does the image belong to the given caption?

The fire at the Darul Uloom school…

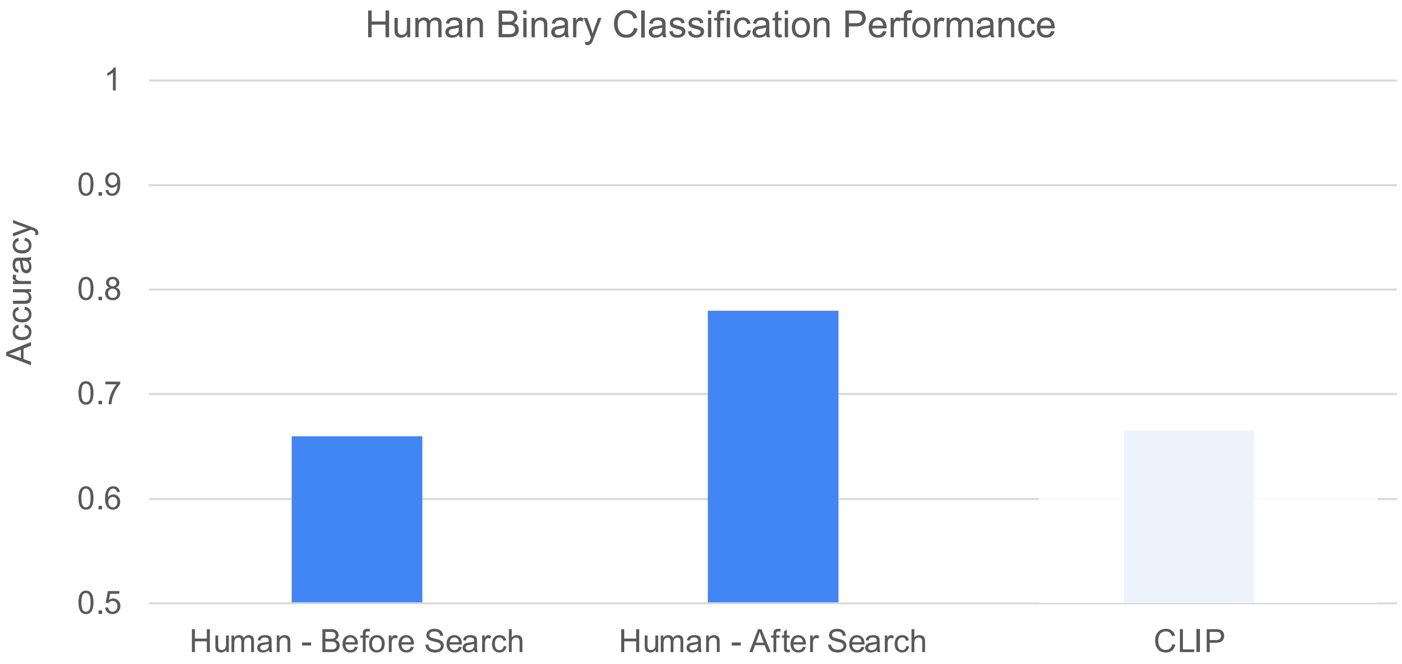
Human Evaluation

- Same binary classification task
- 100 sample subset
  - ~25% from each split
  - ~50% pristine, falsified
- Before and after internet search

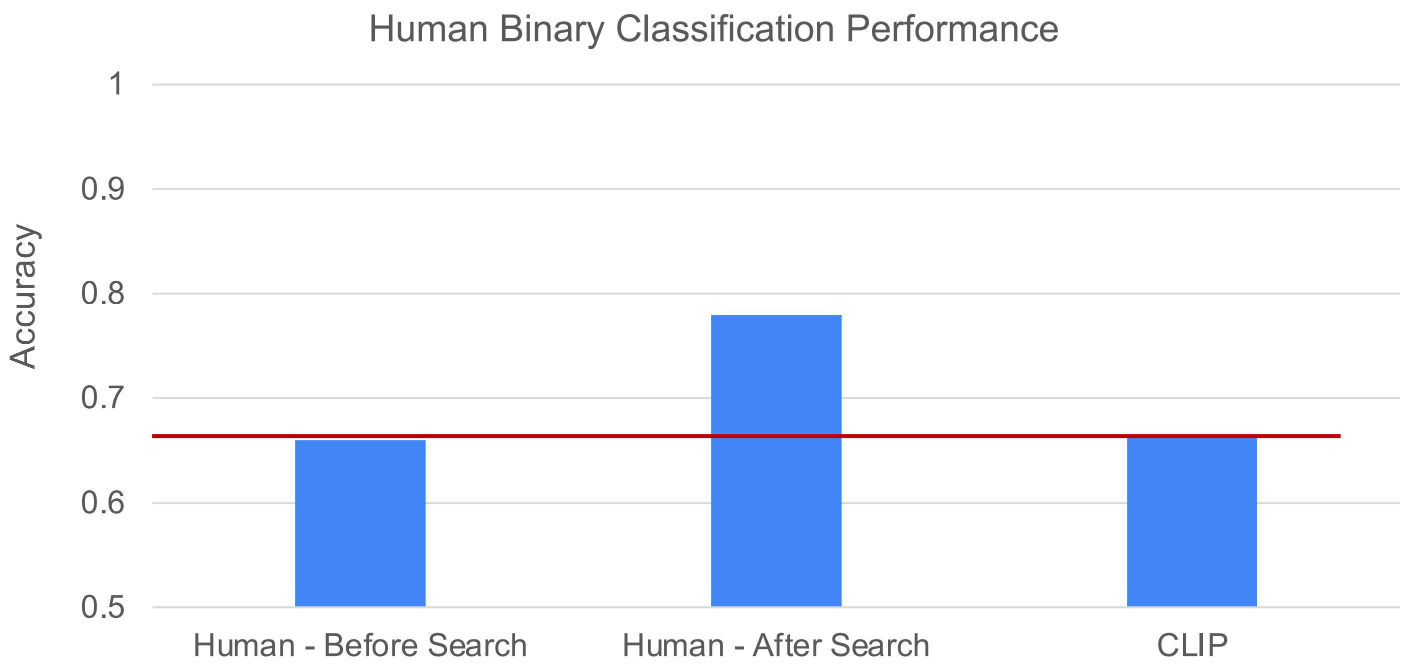
Does the image belong to the given caption?

The fire at the Darul Uloom school…

Human Evaluation



Human Evaluation



Future Directions

North Carolina State Wolfpack forward Beejay Anya...

Symbols

Guinea s David Alvarez celebrates after scoring the winner against Senegal.

Actions

... rally against labour reforms in Athens ...

Locations

BAIR

Future Directions

North Carolina State Wolfpack forward Beejay Anya...

Symbols

Guinea s David Alvarez celebrates after scoring the winner against Senegal.

Actions

... rally against labour reforms in Athens ...

Locations

Future Directions

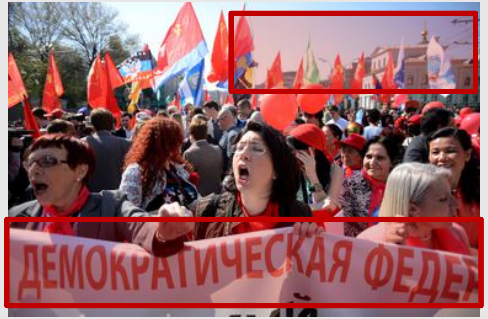
North Carolina State Wolfpack forward Beejay Anya...

Symbols

Guinea s David Alvarez celebrates after scoring the winner against Senegal.

Actions

... rally against labour reforms in Athens ...



Locations

Takeaways

- The automation of cheapfakes is now a realistic threat.
- Humans are susceptible to fakes from NewsCLIPpings.
- Models require improvements in understanding of symbols, facial expressions, and locations.

BAIR
BERKELEY ARTIFICIAL INTELLIGENCE RESEARCH

Thank you!

https://github.com/g-luo/news_clippings
http://arxiv.org/abs/2104.05893

BAIR
BERKELEY ARTIFICIAL INTELLIGENCE RESEARCH