Automatically Identifying Complaints in Social Media

Daniel Preoțiuc-Pietro, Bloomberg

Mihaela Găman, Politehnica University of Bucharest

Nikolaos Aletras, University of Sheffield

Bloomberg
Engineering

TechAtBloomberg.com

Complaints

Complaints are used in our daily communication

I wish I had more time to tell you about complaining, but the organizers only allocated 15 minutes for this talk.

12:42 PM · Jul 31, 2019 · Twitter Web App

Complaints

Complaints are used in our daily communication

What is the linguistic goal of complaining?

I wish I had more time to tell you about complaining, but the organizers only allocated 15 minutes for this talk.

12:42 PM · Jul 31, 2019 · Twitter Web App

Bloomberg

Engineering

Complaints

Complaints are used in our daily communication

What is the linguistic goal of complaining?

1. Affecting positive face (_{Goffman, 1967})

- Positive face – desire to be liked
- Cast the complainee in a bad light

I wish I had more time to tell you about complaining, but the organizers only allocated 15 minutes for this talk.

12:42 PM · Jul 31, 2019 · Twitter Web App

Bloomberg

Engineering

Complaints

Complaints are used in our daily communication

What is the linguistic goal of complaining?

1. Affecting positive face

2. Affecting negative face

- Negative face - the desire not to be imposed upon
- Complaint is addressed to a complainee
- Aims to impose to the complainee reparations

I wish I had more time to tell you about complaining, but the organizers only allocated 15 minutes for this talk.

12:42 PM · Jul 31, 2019 · Twitter Web App

Bloomberg

Engineering

Complaints

Complaints are used in our daily communication

What is the linguistic goal of complaining?

1. Affecting positive face

2. Affecting negative face

What do complaints express?

I wish I had more time to tell you about complaining, but the organizers only allocated 15 minutes for this talk.

12:42 PM · Jul 31, 2019 · Twitter Web App

Bloomberg

Engineering

Complaints

Complaints are used in our daily communication

What is the linguistic goal of complaining?

1. Affecting positive face

2. Affecting negative face

What do complaints express?

A negative mismatch between reality and expectation

I wish I had more time to tell you about complaining, but the organizers only allocated 15 minutes for this talk.

12:42 PM · Jul 31, 2019 · Twitter Web App

Bloomberg

Engineering

Complaints

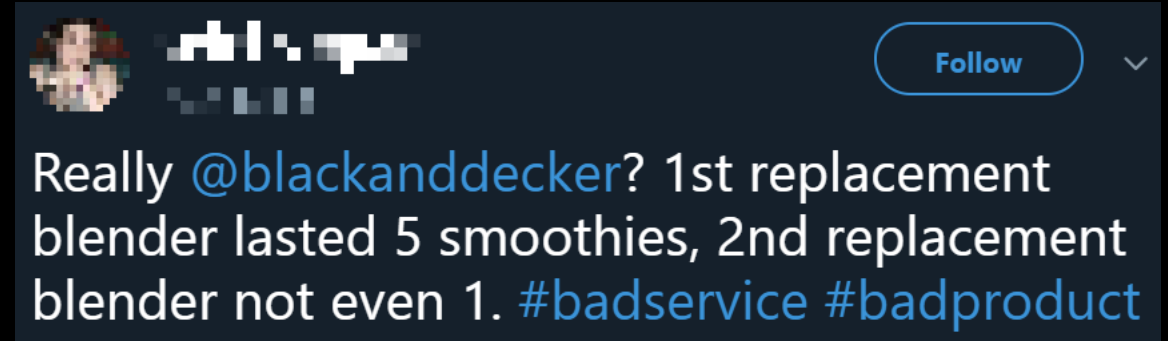Complaints are used in our daily communication

What is the linguistic goal of complaining?

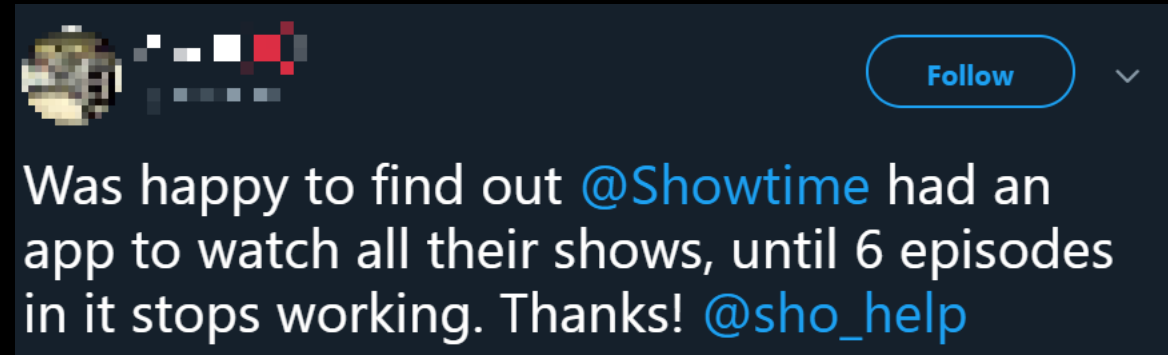1. Affecting positive face

2. Affecting negative face

What do complaints express?

A negative mismatch between reality and expectation

Complaints are not sentiment

Really @blackanddecker? 1st replacement blender lasted 5 smoothies, 2nd replacement blender not even 1. #badservice #badproduct

Complaint, Negative sentiment

Was happy to find out @Showtime had an app to watch all their shows, until 6 episodes in it stops working. Thanks! @sho_help

Complaint, No sentiment

Bloomberg

Engineering

Complaints – Applications

Understanding complaints is useful for:

- Organizations and brands
  — Improve customer experience by addressing client concerns
  — Inferring current issues
- Linguistics
  — Understanding context and types
- Psychologists
  — Human traits specific of complaining
- NLP applications
  — Identify complaining intent in dialogues

Bloomberg

Engineering

Data – Annotation

"A complaint presents a state of affairs which *breaches* *the writer's favorable* *expectation**"*

(Olshtain & Weinbach, 1987)

Bloomberg

Engineering

Data – Annotation

"A complaint presents a state of affairs which breaches *the writer's favorable* expectation*"*

(Olshtain & Weinbach, 1987)

Annotated by two of the authors
- Hard to annotate using the crowd
- Each tweet annotated by both annotators
- A tweet is a complaint if it has a complaint speech act
- All tweets in English
- Cohen's Kappa = 0.731
- Disagreements resolved through discussion between annotators

Bloomberg

Engineering

Data – Sampling

Complaints on social media are not very frequent (<1% of tweets)

Intuition: Twitter users usually complain to customer support

Data – Sampling

Complaints on social media are not very frequent (<1% of tweets)

Intuition: Twitter users usually complain to customer support

Start with 93 customer support Twitter accounts

@WholeFoods this is the second time this month, in a different state, that I've ended up with expired yogurt from your stores. Yogurt sold on July 20 shouldn't have expired on July 6.

11:46 AM - 21 Jul 2019

Whole Foods Market ✓ @WholeFoods · 12h
Replying to ▪ ▪ ▪
Thanks for bringing this to our attention, Bob. Mind sending us a DM with your contact info and store location? We'd like to look into this.

Bloomberg

Engineering

Data – Sampling

Complaints on social media are not very frequent (<1% of tweets)

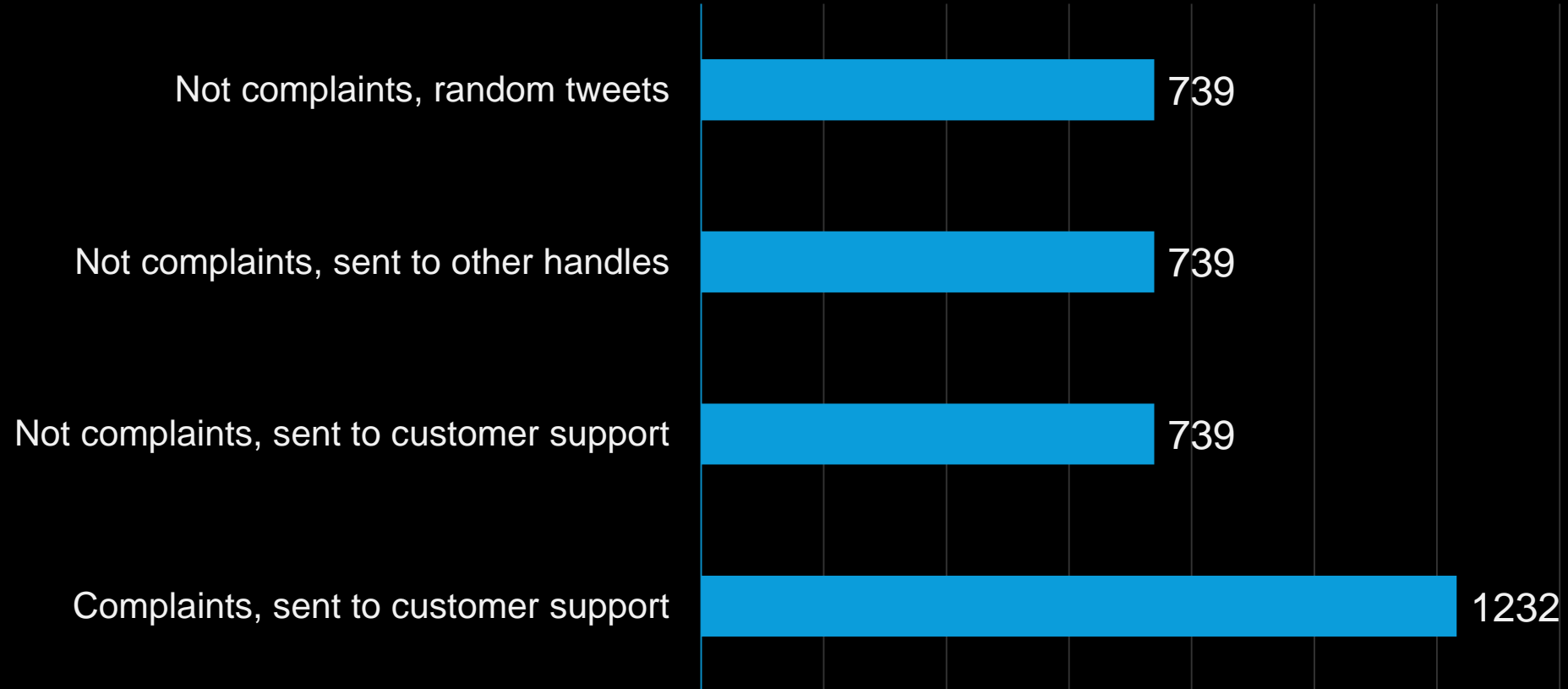Intuition: Twitter users usually complain to customer support

Start with 93 customer support Twitter accounts

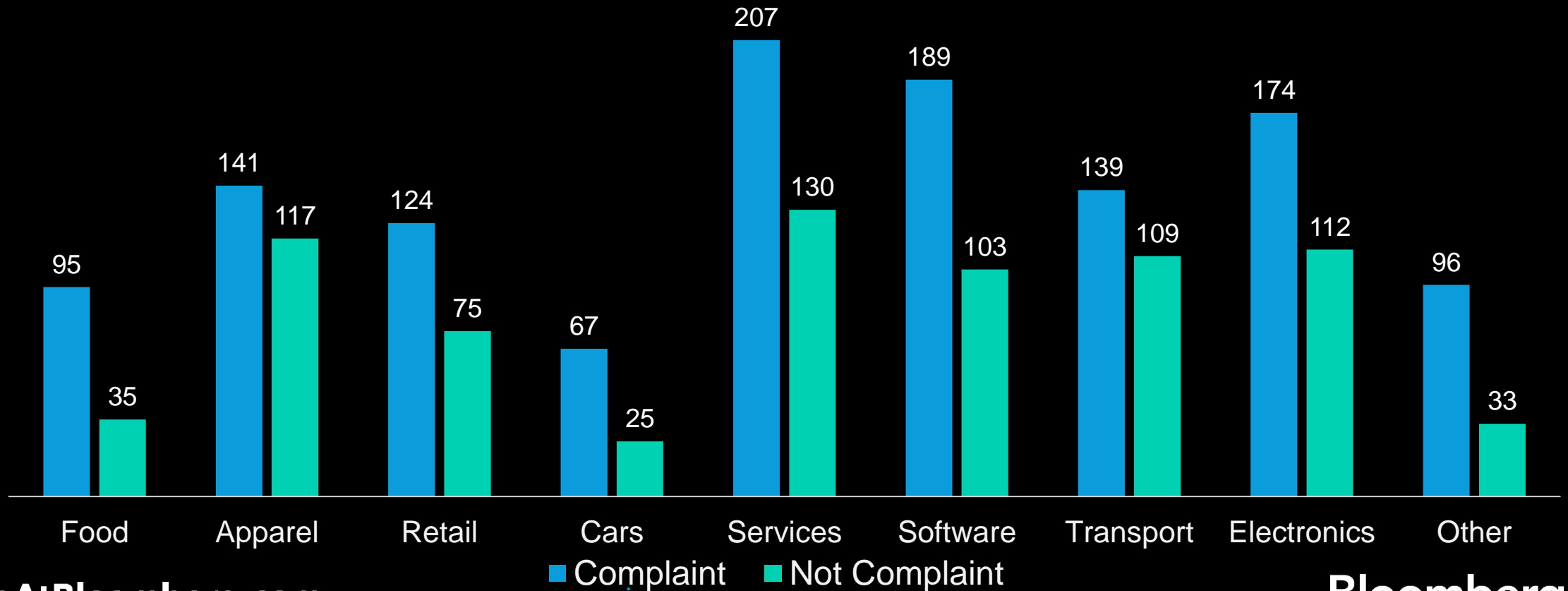Download for annotation customer tweets sent to these accounts

@WholeFoods this is the second time this month, in a different state, that I've ended up with expired yogurt from your stores. Yogurt sold on July 20 shouldn't have expired on July 6.

11:46 AM - 21 Jul 2019

Whole Foods Market ✓ @WholeFoods · 12h

Thanks for bringing this to our attention, Bob. Mind sending us a DM with your contact info and store location? We'd like to look into this.

Bloomberg

Engineering

Data – Statistics

Data set freely available: https://github.com/danielpreotiuc/complaints-social-media

Bloomberg

Engineering

Data – Statistics

Data set freely available: https://github.com/danielpreotiuc/complaints-social-media
Tweets matched to a domain based on the customer support handle

	Food	Apparel	Retail	Cars	Services	Software	Transport	Electronics	Other
Complaint	95	141	124	67	207	189	139	174	96
Not Complaint	35	117	75	25	130	103	109	112	33

■ Complaint   ■ Not Complaint

Features

We experiment with traditional features to aid with our analysis

Complaint-specific features
- Requests (Danescu-Niculescu-Mizil et al, 2013)
- Politeness (Danescu-Niculescu-Mizil et al, 2013)
- Temporal References (Zhong et al, 2017)
- …

Sentiment models
- MPQA (Wiebe et al 2005)
- NRC (Mohammad & Turney 2013)
- (Volkova & Bachrach, 2016)
- VADER (Gilbert & Hutto, 2014)
- Stanford (Socher et al, 2013)

Bloomberg

Engineering

Features

We experiment with traditional features to aid with our analysis

Part-of-speech tags

Topics:
- LIWC (Pennebaker et al, 2007)
- Word2Vec (Preotiuc-Pietro et al, 2015)

Unigrams

Bloomberg

Engineering

Analysis – Complaints

Negation

Verbs

Pronouns

Sentiment

Temporal References

Issues

*Univariate Point-Biserial Correlation between unigram features and complaint
All correlations significant at p < 0.1, two-tailed t-test, Simes corrected

Bloomberg

Engineering

Analysis – Complaints

Negation

- Illustrates the breach in expectations

Verbs

Pronouns

Sentiment

Temporal References

Issues

*Univariate Point-Biserial Correlation between unigram features and complaint
All correlations significant at p < 0.1, two-tailed t-test, Simes corrected

Bloomberg

Engineering

Analysis – Complaints

Negation

Verbs
- Past participle
  — describe events causing the breach in expectations
  — e.g. *nobody is answering*
- Present, 3rd person singular
  — provide setup to event description
  — e.g. *got an e-mail saying*

Pronouns

Sentiment

Issues

Temporal References

*Univariate Point-Biserial Correlation between unigram features and complaint
All correlations significant at p < 0.1, two-tailed t-test, Simes corrected

Bloomberg

Engineering

Analysis – Complaints

Negation

Verbs

Pronouns
• Possessive

Sentiment

Issues

Temporal References

still won't issue
on why website
service can't is charged fix
working not my no
customer ? been
days error

*Univariate Point-Biserial Correlation between unigram features and complaint
All correlations significant at $p < 0.1$, two-tailed t-test, Simes corrected

Bloomberg

Engineering

Analysis – Complaints

Negation

Verbs

Pronouns

Sentiment
- Not associated with negative sentiment
- LIWC
- Sentiment models

Issues

Temporal References

still won't issue
service on why website
working can't is charged fix
customer ? not my no
days error been

*Univariate Point-Biserial Correlation between unigram features and complaint
All correlations significant at p < 0.1, two-tailed t-test, Simes corrected

Bloomberg

Engineering

Analysis – Complaints

Negation

Verbs

Pronouns

Sentiment

Issues
- Describing the event or issue
- Asking for assistance

Temporal References

staff service customer agent job contact assist

closed between road delayed accident outage delay

still won't issue on why website service can't is charged fix working not my no customer ? been days error

*Univariate Point-Biserial Correlation between unigram features and complaint
All correlations significant at $p < 0.1$, two-tailed t-test, Simes corrected
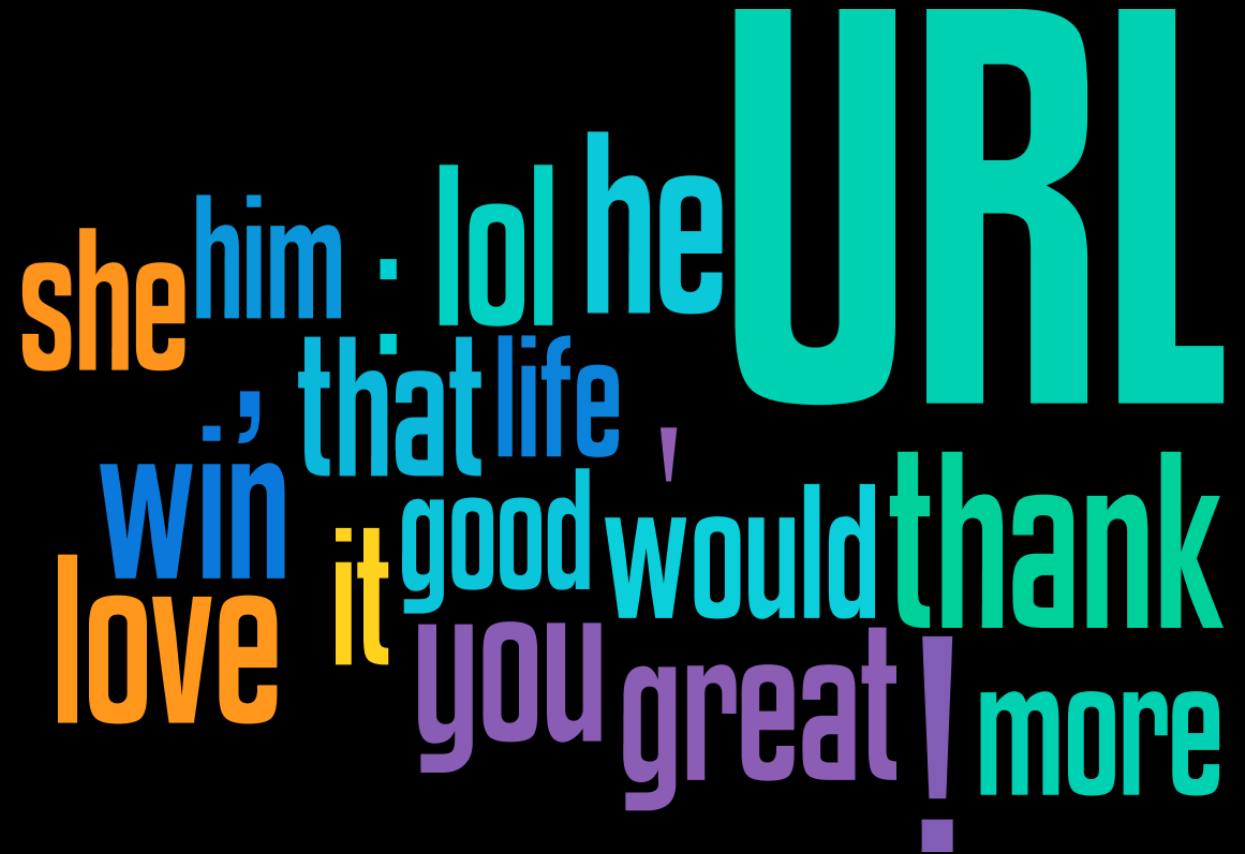
Bloomberg

Engineering

Analysis – Complaints

Negation

Verbs

Pronouns

Sentiment

Issues

Temporal References
- Reference to event causing breach of expectations

*Univariate Point-Biserial Correlation between unigram features and complaint
All correlations significant at p < 0.1, two-tailed t-test, Simes corrected

Bloomberg

Engineering

Analysis – Not Complaints

Pronouns
- Third person

Positive sentiment

Laughter and gratitude

*Univariate Point-Biserial Correlation between unigram features and complaint
All correlations significant at p < 0.1, two-tailed t-test, Simes corrected
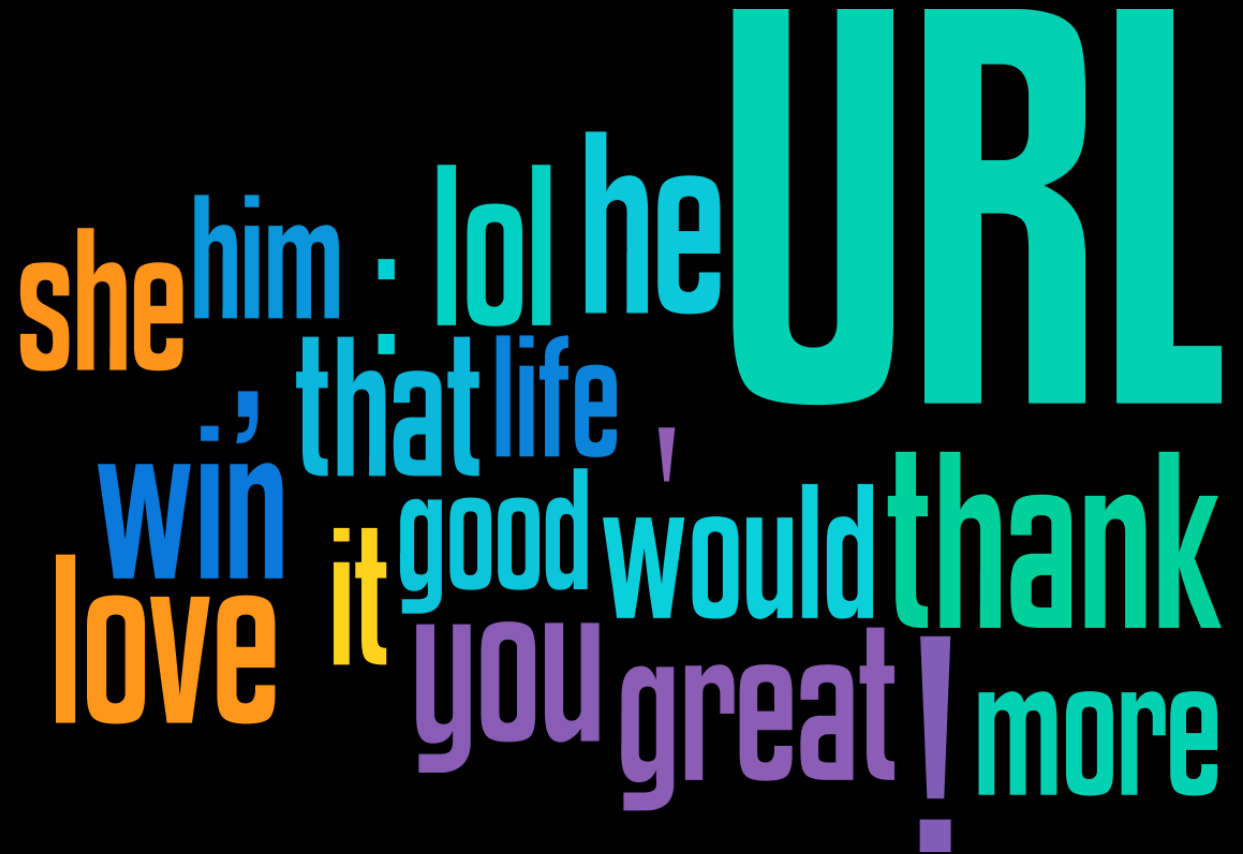
Bloomberg

Engineering

Analysis – Not Complaints

Pronouns

Positive sentiment
- Twitter users focus on descriptions
- Complaints are often compensated with positive sentiment (Vasquez, 2011)

Laughter and gratitude

*Univariate Point-Biserial Correlation between unigram features and complaint
All correlations significant at p < 0.1, two-tailed t-test, Simes corrected
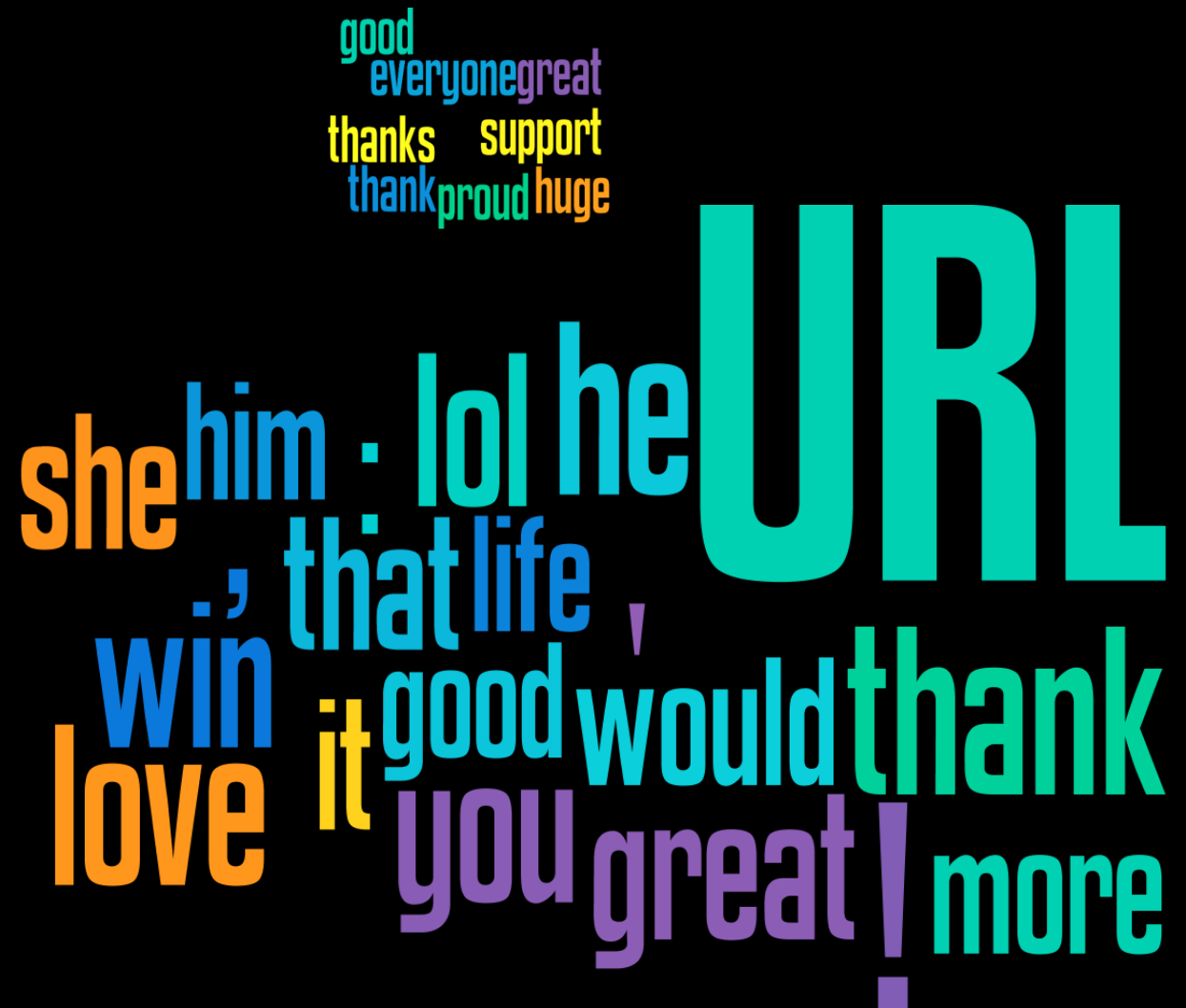
Bloomberg

Engineering

Analysis – Not Complaints

Pronouns

Positive sentiment

Laughter and gratitude

*Univariate Point-Biserial Correlation between unigram features and complaint
All correlations significant at p < 0.1, two-tailed t-test, Simes corrected

Bloomberg

Engineering

Prediction

Task
- Binary classification

Evaluation
- Macro-averaged F1
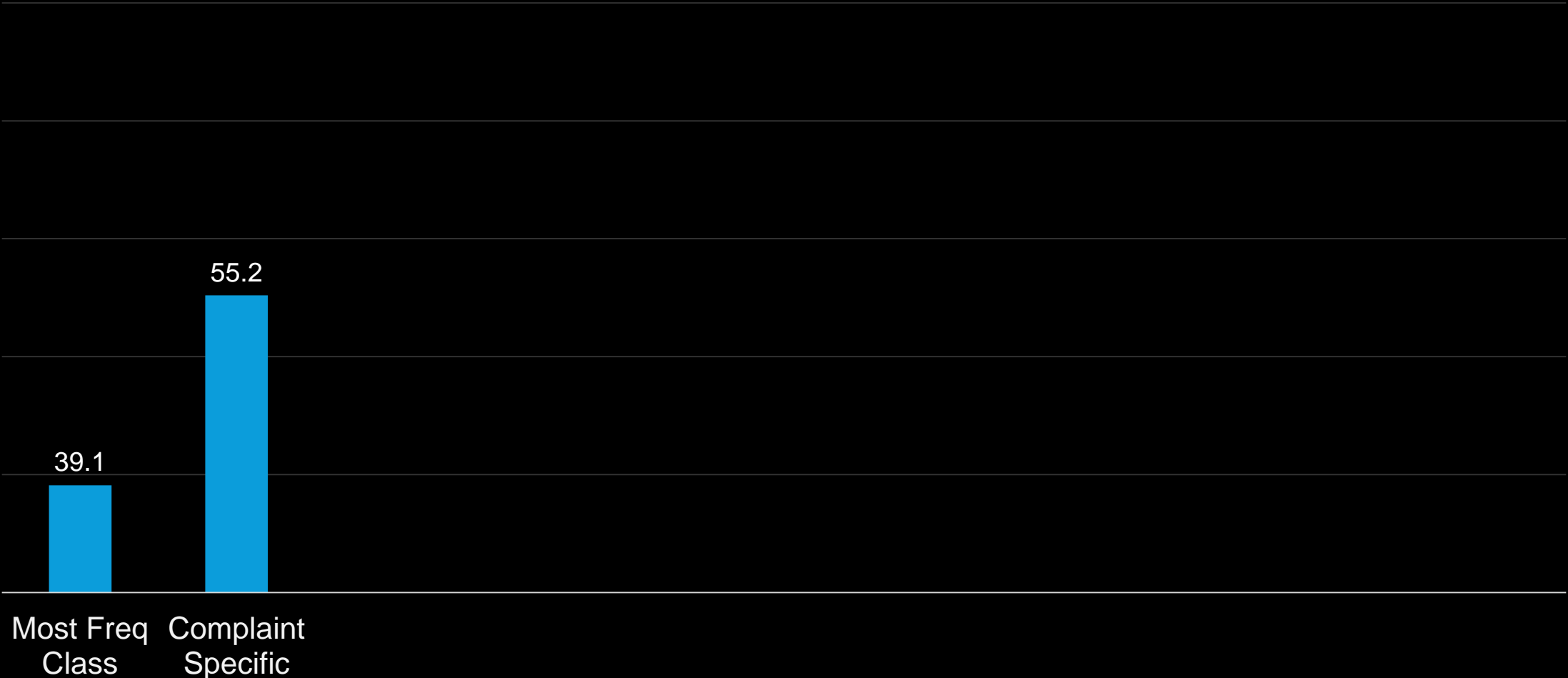- Accuracy, ROC AUC (results in the paper)

Data split
- Stratified 10 fold cross-validation
- Hyperparameters set through 3 fold cross-validation on training set

Methods
- Logistic Regression with Elastic Net regularization
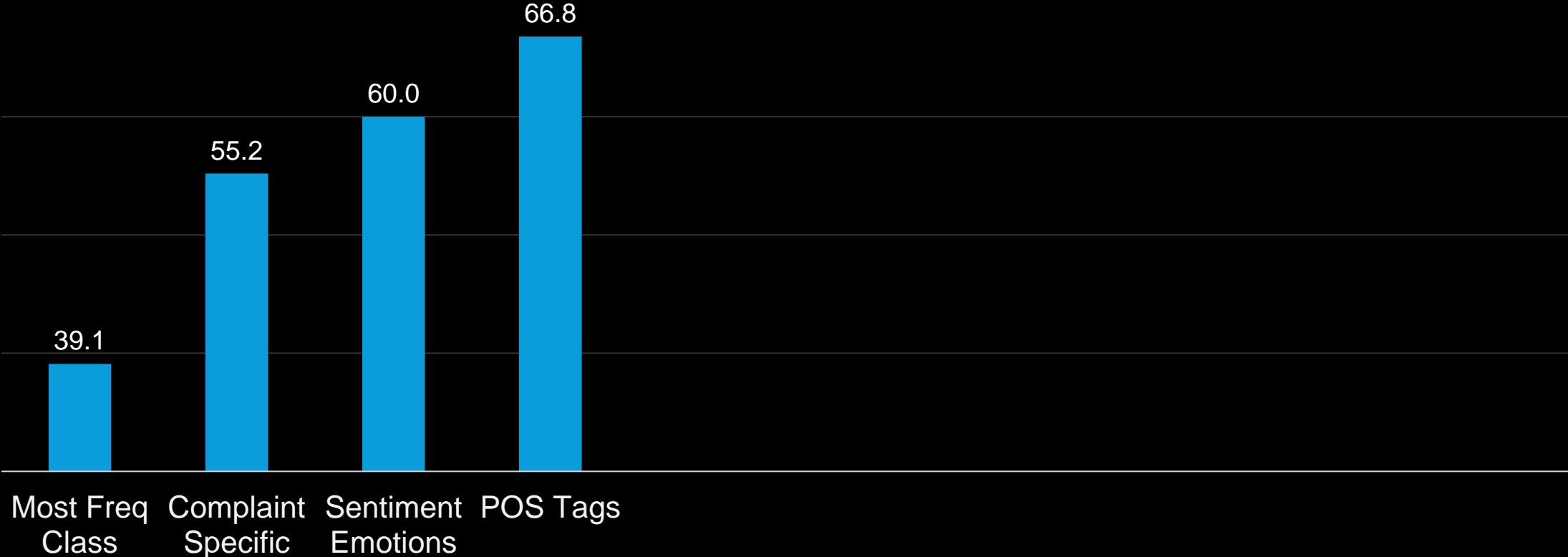 — Using all previous features
- BiLSTM
- MLP

Bloomberg

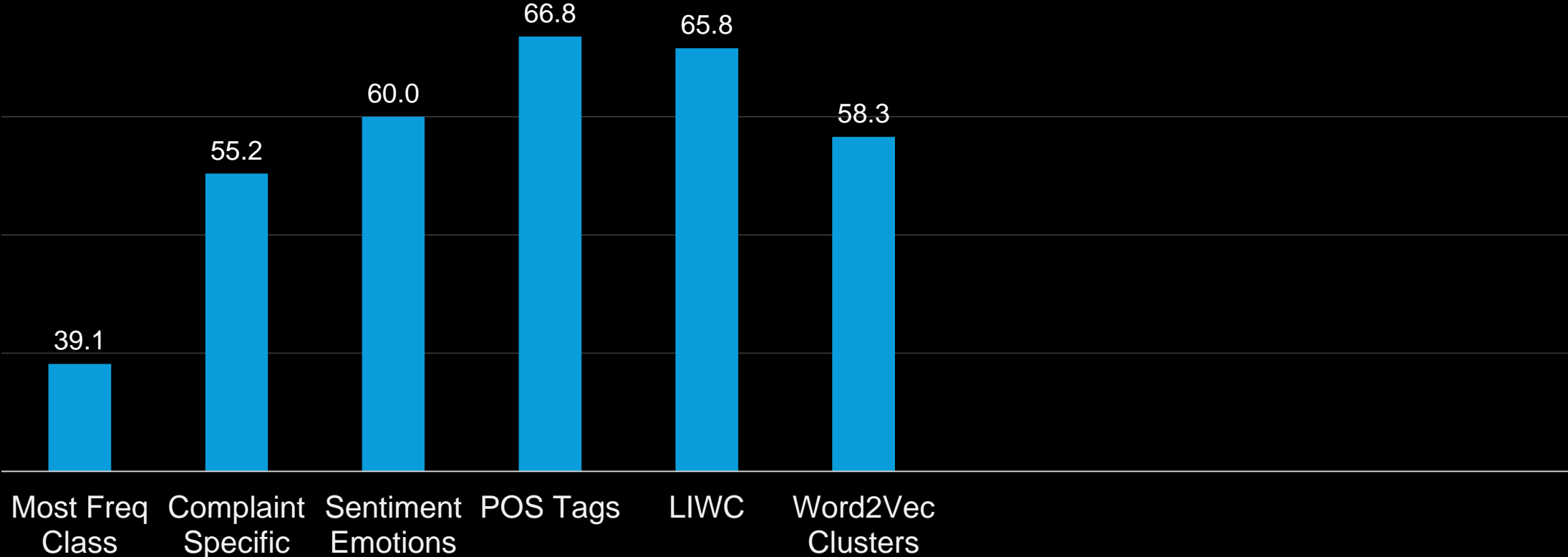Engineering

Prediction

Bar chart showing: Most Freq Class = 39.1, Complaint Specific = 55.2

Prediction

Bar chart showing prediction accuracy values: Most Freq Class = 39.1, Complaint Specific = 55.2, Sentiment Emotions = 60.0

Prediction

Prediction

Bar chart showing prediction values:
- Most Freq Class: 39.1
- Complaint Specific: 55.2
- Sentiment Emotions: 60.0
- POS Tags: 66.8
- LIWC: 65.8
- Word2Vec Clusters: 58.3

Prediction

39.1	55.2	60.0	66.8	65.8	58.3	77.5
Most Freq Class	Complaint Specific	Sentiment Emotions	POS Tags	LIWC	Word2Vec Clusters	Unigrams

Prediction

Most Freq Class	Complaint Specific	Sentiment Emotions	POS Tags	LIWC	Word2Vec Clusters	Unigrams	Combined
39.1	55.2	60.0	66.8	65.8	58.3	77.5	78.0

Prediction

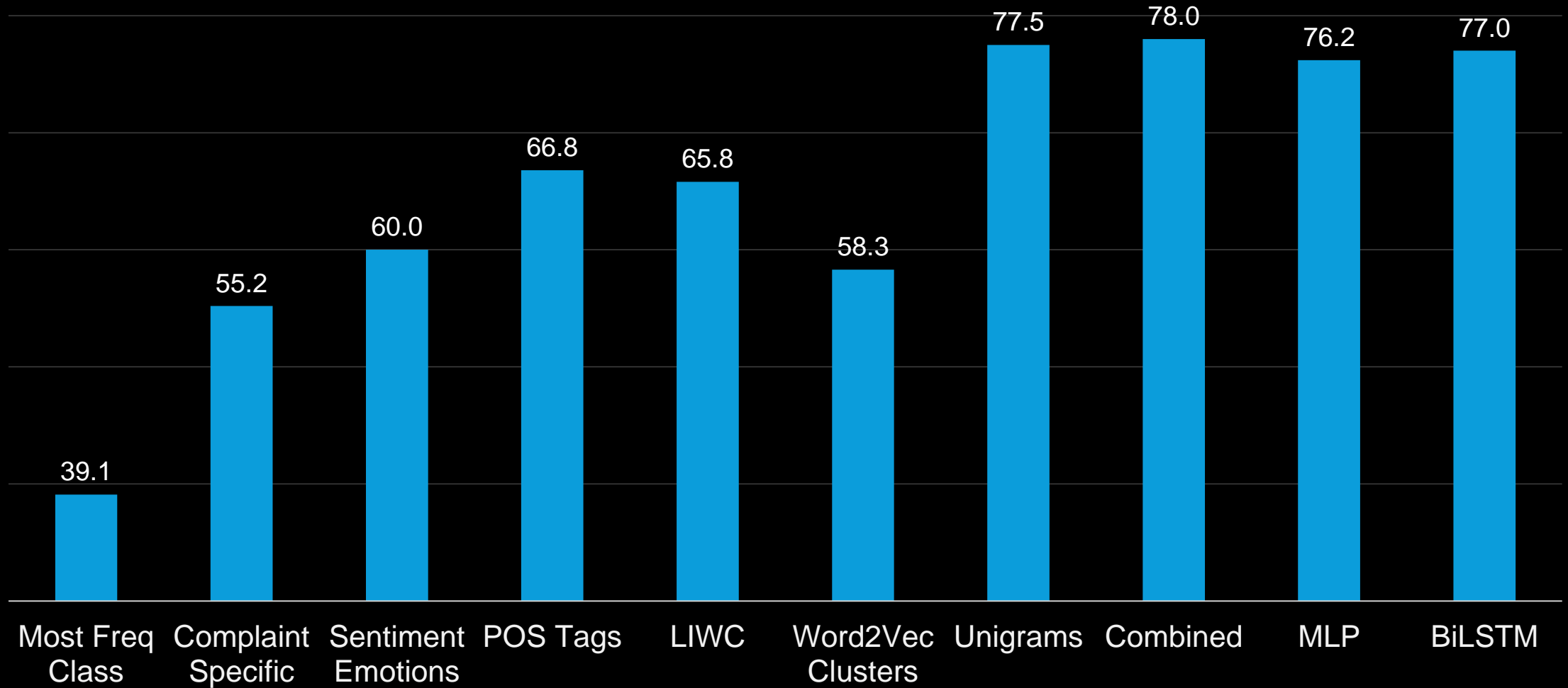| Most Freq Class	Complaint Specific	Sentiment Emotions	POS Tags	LIWC	Word2Vec Clusters	Unigrams	Combined	MLP	BiLSTM
39.1	55.2	60.0	66.8	65.8	58.3	77.5	78.0	76.2	77.0

Prediction – Other Experiments

Distant supervision
- Collect 18K tweets using hashtags related to complaints
  — e.g. #lostbusiness, #worstbrand
- Boost F1 by 1 point through domain adaptation

Domain adaptation
- Use domain information to train domain specific classifiers
- Domain adaptation improves performance on each domain

Cross-Domain
- Train - Test across topics

Bloomberg

Engineering

Takeaways

Introduced complaint prediction
- Different to negative sentiment

New Twitter data set available for research
- Multiple domains

Analyzed linguistic markers of complaints

Complaints can be predicted with good accuracy
- We need to study other types of complaints
- More advanced methods for complaint prediction

We are hiring:
- NYC – http://careers.bloomberg.com/job/detail/74022
- London – http://careers.bloomberg.com/job/detail/74154

Bloomberg
Engineering