How Meaningful These Intonational Contours Are!

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1. Introduction

English exclamatives' syntactic forms

a. Salvador is very successful!
b. How very successful Salvador is!
c. Has Salvador been successful!
d. The success Salvador has had!

→ ***…intonational forms?***

2a. Background: Intonation?

Suprasegmentals (e.g., f0, intensity, duration) that convey **'post-lexical' meanings**

formal / grammatical / illocutionary *(e.g., contrastive topic)*	~~~~	**emotional / pragmatic / perlocutionary** *(e.g., shock)*

Analysis may require some human annotation (e.g., ToBI, PoLaR)

2b. Background: Exclamatives!

Rett & Sturman (2021) on mainstream US English exclamatives:

[[mirativity]] *(syntactic/semantic core)* ↔ **L+H*** *(prosodic core)*

Other acoustic features: iconically enhance exclamative meaning

3. Research Goals

Primary Goal:

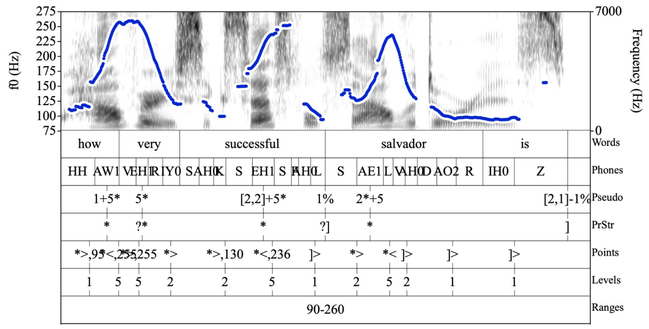
Model of which aspects of intonation signal an utterance's status as exclamative

Secondary Goal:

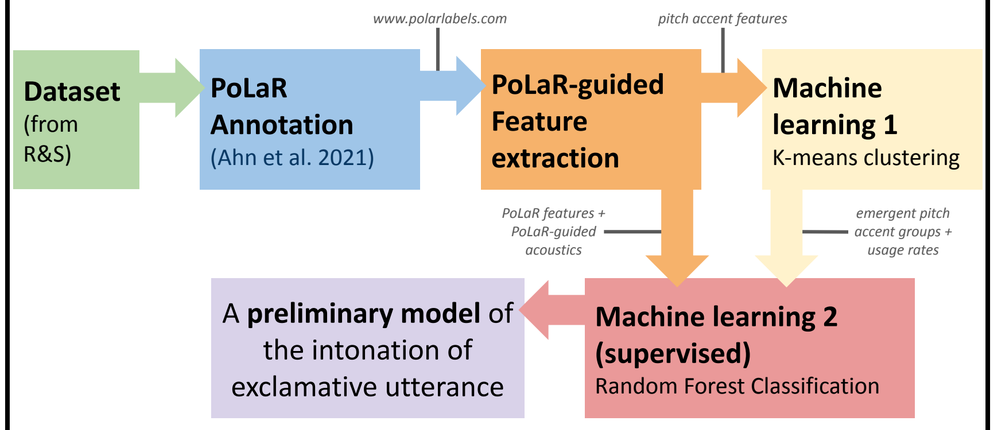
Proof of concept for future work on intonational meaning

Central Question

Is there an intonational core to English exclamatives?



4. Methods



5. Results

- Clustering analysis finds 3 groups of pitch accents, differentiated by slope (between_SS / total_SS = 81.1 %)
  → ***Cluster K2 looks like L+H****
- Classification analysis distinguishes exclamatives (Estimated Error Rate: 14.08%)
  → ***Usage of K2 very important***
  → *Many of R&S' other findings are replicated too*

6. Conclusions / Future Work

- Results **support R&S' findings** based on phonological labels
  - **Using non-phonological labels + analysis**
- **Proof of concept:** emergent cluster categories potentially standing in for phonological labels
  - Methodology for new domains / languages / varieties **beyond current model of MUSE phonology**

Selected References:

- Beckman & Hirschberg. 1994. The ToBI annotation conventions.
- Ahn et al. 2021. PoLaR Annotation Guidelines (version 1.0). Available at https://osf.io/usbx5.
- Rett & Sturman. 2021. Prosodically marked mirativity. In Proceedings of WCCFL 37.

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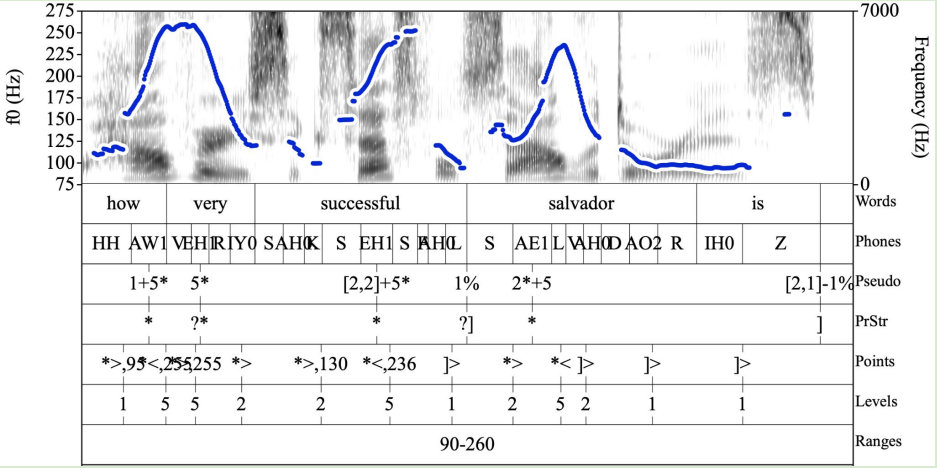
Exclamatives forms

- Exclamative meanings in English map onto a variety of syntactic forms:

  a. (Wow,) Salvador is very successful!
  b. (Wow,) how very successful Salvador is!
  c. (Wow,) has Salvador been successful!
  d. (Wow,) the success Salvador has had!

- An example how they map onto intonation:



Varied syntactic forms of exclamatives have a common core, but…

Is there a common intonational core to exclamatives?

Background – Exclamative Intonation

Previous work by Rett & Sturman (2021) on mainstream US English exclamatives

e.g., ***What big teeth you have!***

- Empirical findings:

Categorical Measures	**Continuous Measures**
L+H* pitch accents	Extra high pitch accent peaks Increased rhythmicity

- Analysis:

[[mirativity]] *(syntactic/semantic core)* ⟷ **L+H*** *(prosodic core)*

Other intonational characteristics: iconically enhance exclamative meaning

Our Research Goals

- Can we verify this analysis **with a different methodology**?

- Primary Goal:

  Model which aspects of intonation have predictive power to classify utterances as exclamative

  - Using more intonational details in the model (*e.g., those lost in categorical annotations like ToBI*)
  - Transcribing intonation with PoLaR (*uniform across languages, facilitating cross-linguistic comparison**)

- Secondary Goal: *Verify PoLaR + data mining methods to investigate semantic/pragmatic categories*

  Proof of concept for future work on intonational meaning

* cf. R&S's "future work" section

Methods

Data
128 exclamatives
128 fillers
(data from R&S)

PoLaR Annotation
(Ahn et al. 2021)
Identification of key intonational properties

www.polarlabels.com

Feature extraction
PoLaR-facilitated extraction of granular acoustic features

pitch accent features

Machine learning 1: K-means clustering
Unsupervised classification of pitch accents into clusters

PoLaR features + PoLaR-guided acoustics

emergent pitch accent groups + usage rates

Machine learning 2 (supervised): Random Forest Classification
Supervised learning based on K-means clusters + acoustic/annotation features
→ classify as exclamative or not
→ indicate feature usefulness

	Predicted as:		
Actual:	**Filler**	**Excl.**	Class error
Filler	***23***	7	*0.23 (7/30)*
Excl.	3	***38***	*0.07 (3/41)*

Estimated Error Rate (on held out data): **14.08%**

Goals: Met

- Can we verify R&S' analysis **with a different methodology**?

- Primary Goal:

  Model which aspects of intonation have predictive power to classify utterances as exclamative

  → ***Achieved!***

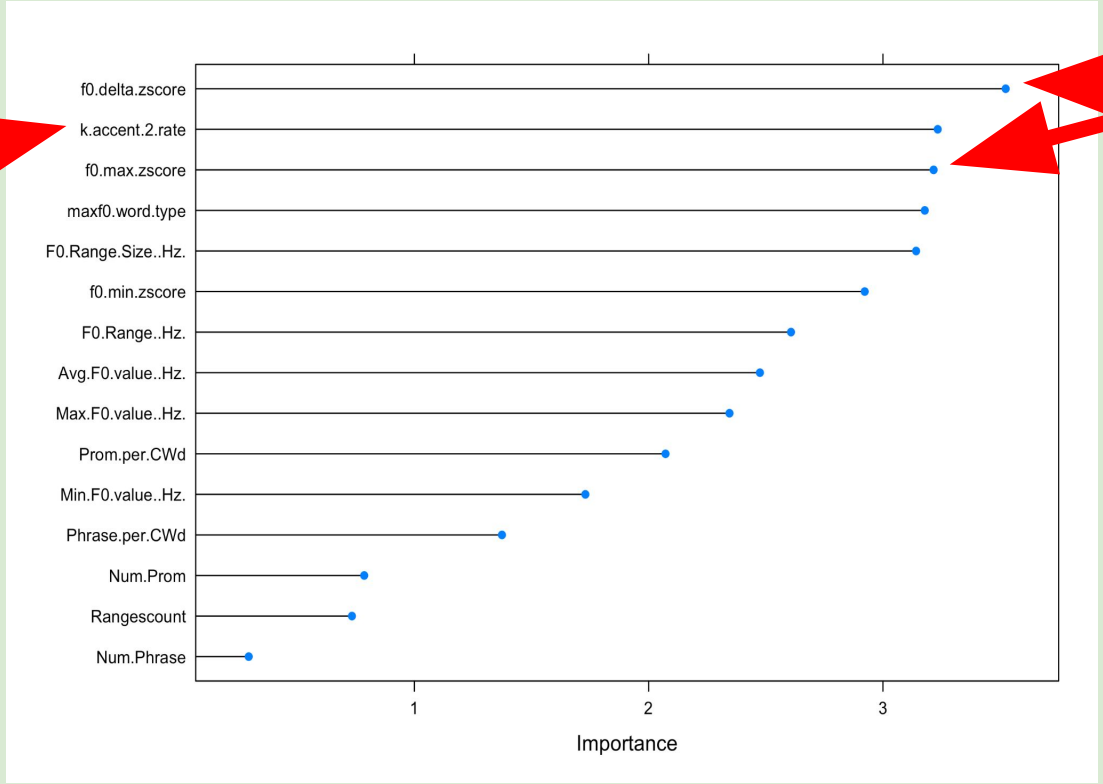
- Secondary Goal:

  Proof of concept for future work on intonational meaning

Relative Importance of Features in Random Forest Classification

rapid rise pitch accent (K2) usage in an utterance

cf. R&S' L+H finding*



f0 range information

cf. R&S' extra high pitch accent peaks

Goals: Met

- Can we verify R&S' analysis **with a different methodology**?

  → ***YES! Using non-phonological labels + analysis***

- Primary Goal:

  Model which aspects of intonation have predictive power to classify utterances as exclamative

- Secondary Goal:

  Proof of concept for future work on intonational meaning

  → ***Achieved!***

Discussion & Conclusions

- **Proof of concept:** Emergent cluster categories potentially standing in for phonological labels

- **Advantages for this methodology include:**
  - PoLaR's low barrier to entry
  - PoLaR's **usability in new domains / languages / varieties beyond current model of MUSE phonology**
  - Replicability of machine learning analyses

Coming Soon...

- A complete analysis of this entire dataset
- PoLaR-bsed analysis tools (***PoLaR*** *Basic* ***E****xtraction and* ***A****nalysis in* ***R***)
- More work on meaning and intonation (*NSF-supported grant work*)

Thank you!