TADA
Task Agnostic Dialect Adapters

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Dialects of English

- All natural language follows a **systematic** set of rules
- All natural languages experience **variation**
- **dialect**: a group of systematic variations in a language

<table>
<thead>
<tr>
<th>Country</th>
<th>Total English speakers</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>1,179,874,130</td>
</tr>
<tr>
<td>United States</td>
<td>316,107,532</td>
</tr>
<tr>
<td>India</td>
<td>128,539,090</td>
</tr>
<tr>
<td>Pakistan</td>
<td>115,044,691</td>
</tr>
<tr>
<td>Nigeria</td>
<td>103,198,040</td>
</tr>
</tbody>
</table>

*Rickford 2020*
Example: Negative Inversion

Do these sentences mean the same thing?

“SHE LOVES THE FACT THAT NOBODY LIKES HER.”

▼

“SHE LOVES THE FACT THAT DON’T NOBODY LIKE HER.”

Foreman 1999
Example: Negative Inversion

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Foreman 1999

High Acceptability

Medium Acceptability

Low Acceptability

Unacceptable
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Foreman 1999

- High Acceptability
- Medium Acceptability
- Low Acceptability
- Unacceptable

Matyiku, 2011
How does that cause errors?

Hypothesis:
JANE WISHED EVERYONE LOVED HER!

Premises:
“SHE LOVES THAT NOBODY LIKES HER.”

“SHE DOESN’T LOVE THAT NOBODY LIKES HER.”
Learn Boundaries and Embeddings from SAE

Hypothesis: JANE WISHED EVERYONE LOVED HER!

Premises: “SHE LOVES THAT NOBODY LIKES HER.”

“SHE DOESN'T LOVE THAT NOBODY LIKES HER.”
Same Semantics, Different Embedding

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Retraining Gives New Boundaries and New Embeddings!

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Retraining Works!

![Graph showing AAE Performance for MNLI, QNLI, and QQP tasks with adapters from SAE (Lower Bound) and AAE (Upper Bound).]

- **MNLI**: +2.5% for Adapters from SAE, +3.3% for Adapters from AAE
- **QNLI**: +2.1% for Adapters from SAE, +3.3% for Adapters from AAE
- **QQP**: +3.3% for both Adapters from SAE and AAE

Reproduce VALUE Experiments!
Cost of Retraining is Linear With Number of Tasks

\[ T \times \text{Cost} \]

Reproduce VALUE Experiments!
Cost of Retraining is Linear With Number of Tasks

\[ T \times \text{Cost} \]

Parameters Stored

Carbon Emissions

\[ \text{\$\$ on GPU Hours} \]

Reproduce VALUE Experiments!
Same Boundaries, New Embeddings

Hypothesis:  
JANE WISHED EVERYONE LOVED HER!

Premises:  
“SHE LOVES THAT NOBODY LIKES HER.” ▼  “SHE LOVES THAT DON’T NOBODY LIKE HER.”  “SHE DOESN’T LOVE THAT NOBODY LIKES HER.”
TADA: Task Agnostic Dialect Adaptation for English

- **Goals**: Provide Plug-and-Play Dialect Robustness For All Tasks at Constant Cost
- **Focus**: Align Dialect Embeddings to Standard American English Embeddings
- **Methods**:
  1. Contrastive Alignment at the Sequence Level
  2. Adversarial Alignment at the Token Level
- **Evaluation**:
  1. Multi-VALUE Transformed GLUE
     - 7 Common NLP Classification Tasks
     - 4 Non-SAE Dialects
       - African-American, Indian, Nigerian, and Singaporean Englishes
Traditional Task Adapter Training

“SHE LOVES THAT NOBODY LIKES HER.”

“SHE DOESN’T LOVE THAT NOBODY LIKES HER.”

Pre-Trained Standard American English Language Model

Labeled SAE Task Data

Task Adapters

Optimize Task Loss
Task Agnostic Dialect Adapter Training

“NOBODY CHIP THE PAINT.”

“DON’T NOBODY CHIP THE PAINT”

Unlabeled Aligned Dialect Pairs

Pre-Trained Standard American English Language Model

Optimize Alignment Loss
What is “Alignment Loss”?

Optimize Alignment Loss(es)

Alignment Loss

Minimize Euclidean Distance between Classification token of Target Dialect and Standard American English

- \( \text{Critic}(\text{Dial}) \)

Maximize the Score Given to a Dialectal Sentence By an Adversarial Transformer

Alignment Type

Sequence

Token
Start with Task Adapters, Add Tada, and…

“She LOVES THAT NOBODY LIKES HER.”

“She LOVES THAT DON’T NOBODY LIKE HER.”

“She DOESN’T LOVE THAT NOBODY LIKES HER.”
Improve Dialect Performance at Constant Cost!

![Graph showing improved performance with Task Adapters and TADA](image)
Works for Multiple Dialects!

![Bar chart showing improved Mean GLUE Performance with TADA for different dialects of English.](chart.png)

- **AAVE**: Original 74.0, with TADA 77.8 (3.76% improvement)
- **Singapore**: Original 72.0, with TADA 77.6 (5.58% improvement)
- **Indian**: Original 73.0, with TADA 73.4 (0.37% improvement)
- **Nigerian**: Original 75.0, with TADA 75.5 (0.52% improvement)
There is room-for-growth vs. Task-Specific Methods
Foundations for Task-Agnostic Dialect Research

Dialect Contrastive Learning Code

Dialect Adapters on 😊

TADA Paper

Upon Request!
(Anonymity Prevents Arxiv)
I want your input!

Comments on this doc are open for discussion!

OR

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In Google Slides, you can also use Flaticon’s extension, allowing you to customize and add even more icons.
Nature Icons
SEO & Marketing Icons
Despite being red, Mars is actually a very cold place.

Mercury is closest planet to the Sun and the smallest.

Neptune is the farthest-known planet from the Sun.

Saturn is a gas giant and has several rings.

Venus is the second planet from the Sun and is terribly hot.

"Despite being red, Mars is actually a very cold place"
"Mercury is closest planet to the Sun and the smallest"