



# **Sixteen Facial Expressions Occur in Similar Contexts Worldwide**

Authors: A.S. Cowen, D. Keltner, F. Schroff, B. Jou, H. Adam, G. Prasad  
Journal: Nature



# Introduction

- **Context to the Study:**
  - Understanding the link between facial expressions and social contexts across cultures as it is crucial for grasping how emotions shape human responses to challenges and opportunities.
- **Previous Research:**
  - Evidence on the relationship between social context and facial expressions is limited and often relies on survey-based methods, which may have inherent biases and limitations.
  - Concrete evidence linking specific social contexts to facial expressions is sparse and constrained by language barriers and small sample sizes.
  - Suggests facial expressions may vary across cultures due to social norms and values.



# Study Objective and Methodology

- The study aims to investigate whether naturalistic social contexts, such as weddings or sporting events, are associated with specific facial expressions across diverse cultures.
- Using deep neural networks, the study analyzes 6 million videos from 144 countries to examine the occurrence of 16 types of facial expressions across various contexts.
- These findings show that expressive behavior is common across different cultures and help us understand where emotions come from and why they matter all over the world.



# Facial Expression and Context Annotations

- **Facial Expression Annotation** utilized DNN to recognize 16 facial movement patterns associated with English-language emotion categories (such as happiness, sadness, anger, triumph etc)
- **Context Annotation: Experiment 1**
  - Integrated DNN to process both video content and metadata to classify 3 million videos into 653 emotion-relevant contexts.
  - Contexts included various scenarios like weddings, practical jokes, and protests.
- **Context Annotation: Experiment 2**
  - Employed a DNN exclusively on user-generated titles and descriptions to classify an additional 3 million videos into 1,953 contexts.
  - Designed to mitigate potential biases from visual features and ensure more accurate contextual associations

# Association between regional context and expressions

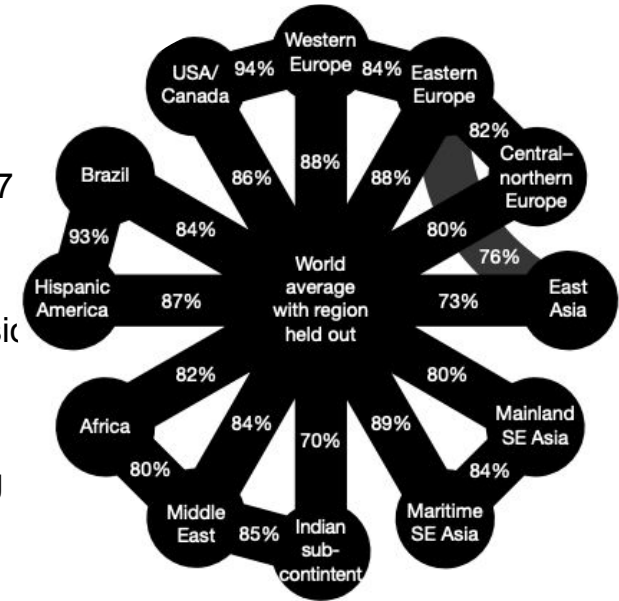


- 144 countries were divided into 12 world regions based on ethnolinguistic overlap to analyze context-expression associations.
- Partial correlations was computed between context annotations and 16 facial expression annotations across videos from each region.
- Findings from Experiment 1: Identified numerous contexts with consistent links to particular facial expressions across regions, supporting the idea that facial expressions are closely tied to meaningful social situations (awe for fireworks, pain in workout)
- Compared results from video-based Experiment 1 with text-based Experiment 2. Despite differences in accuracy (60%, 91.6%) and potential bias, similar connections between contexts and facial expressions were observed across regions, confirming Experiment 1's findings.



# Cross Regional Expression Correlations

- Second order Correlations between different world regions in context-expression associations measuring the degree of similarity
- In experiment 1 correlation between the world regions ranged from 0.7 between Indian subcontinent and East asian to 0.97 between USA/Canada and western europe
- All regions share 70% of their variance with universal context-expression
- In Experiment 2, correlations averaged 0.59, 40% lower than in Experiment 1, mainly due to using language-based descriptions. This introduces variations from language and cultural differences, reducing estimations of cultural universality. This explains why survey-based studies often show more variability.





# Globally Preserved facial expressions

- Used Canonical Correlations Analysis (CCA) - two ways 1) in a leave- one-region-out manner 2) extracting correlated patterns in USA/Canada and see if they are present in all other regions In both cases all 16 canonical correlations were preserved in 12 regions with P and Q value < 0.001.
- These results confirm that all 16 expressions have distinct meaning that are preserved across the modern world.



# Facial Expression differs across cultures?

- We found universality for expression and context . However, just because two things seem connected doesn't mean they happen at the same frequency.
- In experiment 1 videos were traces based on geographic locations with small bins of size 55.6 \*55.6 kms, randomly selecting videos 25,000 from each region and comparing with 653 contexts.
- Turns out, there are differences in how people express themselves depending on where they are.
- Cultural expression differences in surveys may be due to diverse situations or events, not just inherent differences in expression styles.





# Discussions

- There is universality in showing expressions in comparable situations across cultures .
- since these finding were based on videos, was there any influence from western media due to globalization through digital platforms?
- Turns out, the influence was from local culture than western culture
- Middle east - indian culture share 85% of their variance but only 63% and 53% with USA/Canada respectively
- The world average should be correlated to western regions but turns out is it correlated to southeast asia region.
- No evidence for demographic biases such as race, age, socio economic were found (four groups)
- Despite efforts to examine biases, the possibility of unexamined demographic influences remains



# Thank you