Sentiment Analysis of Male and Female Developer Comments:

Exploring Gender Influence on Emotional Expressions in Software Engineering Projects

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Abstract

Sentiment Analysis of large amounts of text data creates new possibilities to explore the group dynamics of how team members interact on software engineering projects. This work analyzes a data set from an incident management system to determine the emotional content of comments in regards to the gender of the commenters. First, a statistical analysis was conducted to determine whether any correlation existed between the emotions displayed in comments and the gender of the author of these comments. Next, a statistical analysis was performed to determine whether a correlation existed between the day of the week and sentiment. Finally, machine learning algorithms were applied to test whether a commenters' gender can be classified based on their emotional expression.

Data Source

The **JIRA Repository Dataset**: Understanding Social Aspects of Software Development

700.000	Issues
2 Million	Comments
100.000	Users
4	Open-source projects

The Apache Software Foundation | **Spring** | **JBoss** | **Codehaus**

Research Questions

- Do male and female commenters differ in emotional expression?
- Does emotional expressiveness differ between days of the week?
- Is there an interaction between gender and emotional expressiveness across days of the week?
- Can a commenter's gender be classified based on emotional expressiveness?

Approach

Gender prediction

Predict developer gender from first name using Gender API

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Database-level work

Select suitable comments for analysis (n = 1.6 million, 97% male) based on accuracy of gender prediction

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Sentiment Analysis

Classify emotion categories and intensity using the WEKA AffectiveTweets package

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Statistical Analysis

Explore connections using independent sample t-test, One-Way ANOVA and Tukey post-hoc analysis in IBM's SPSS Statistics

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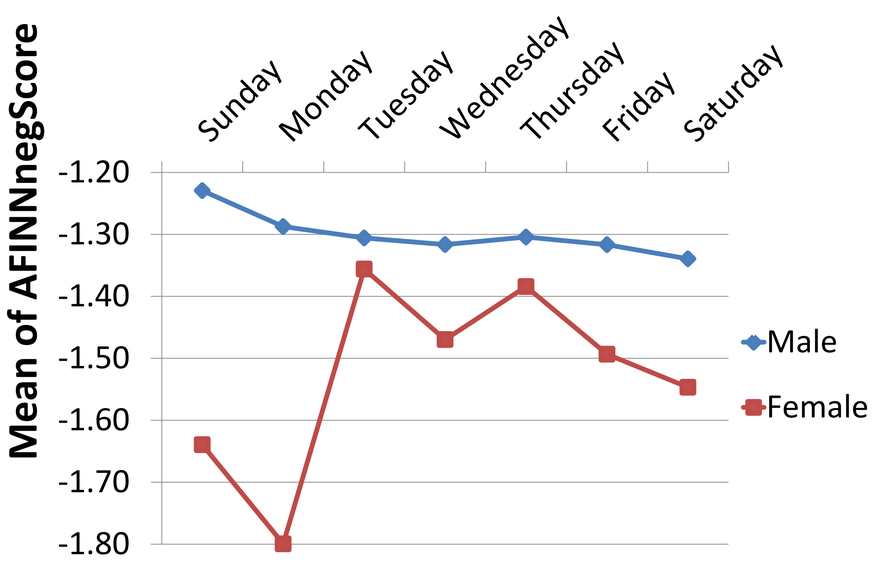
ML Classification

Balance data sample and build tree classifier in Python to classify commenters based on emotional expressiveness

Results

- ☑ Male and female commenters differ significantly in emotional expression across most assessed sentiment categories
- ☑ Emotional expressiveness differs between days of the week
- ☑ There is an interaction between gender and emotional expressiveness across days of the week
- ☑ A commenter's gender can be classified based on sentiment scores

Day of the week



Tree classifier metrics

Accuracy	0.97448
Precision	0.99407
Recall	0.97950
F1-Score	0.98673

Future Directions

- Identify the features that add most discriminatory value when it comes to classifying a commenter's gender
- Verify results on balanced data samples with confirmed gender and other Sentiment Analysis tools
- Identify measures to put insights into practice in software engineering workplaces

Goal Explore how emotional expression of team members in software development teams could influence a team's success, efficiency and team members' satisfaction

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