Circles: Inter-Model Comparison of Multi-Classification Problems with High Number of Classes



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Introduction

- Problem Statement: The recent advancements in machine learning have motivated researchers to generate classification models dealing with hundreds of classes such as in the case of image datasets. However, visualization of classification models with high number of classes and inter-model comparison in such classification problems are two areas that have not received much attention in the literature, despite the ever-increasing use of classification models to address problems with very large class categories.
- Our Solution: We present our interactive visual analytics tool, called Circles, that allows a visual inter-model comparison of numerous classification models with 1K classes in one view. To mitigate the tricky issue of visual clutter, we chose a concentric radial line layout for our inter-model comparison task. Our prototype shows the results of 9 models with 1K classes in a single

view; however, up to 20 models' results can be displayed in this way.

The Dataset: ImageNet dataset consists of a collection of over 15 million high resolution labelled images, belong to an estimated 22k different categories. We use ImageNet Large-Scaled Visual Recognition Challenge (ILSVRC) dataset that is a subset of ImageNet dataset with images belong to 1k different categories. Overall, ILSVRC contains an estimated 1.2 million training images, 50k validation images and 150k testing images. Each model output is a 2-dimensional vector space where the prediction distribution is distributed across 1K classes.

The **Circles** Tool







Models' outputs using a radial bar chart. **Metric Selection Panel** provides the option to select a ML metric to be used for Circle model comparison view.

Mouse hover a particular class highlights the same class in all models and a tooltip appears to show the value of used ML metric using horizontal bar chart.



Range slide bar provides the option to highlight only the classes within the selected range.

Metric Selection Panel provides the option to select a ML metric to be used for Circles model comparison view.

Circle inter-model comparison view, where all classification models' outputs are displayed in a concentric radial line view

Accuracy



Precision
Recall
F1-score
Specificity (True Negative Rate)

False Positive Rate
(Type I Error)
False Negative Rate
(Type II Error)

Plot Spacing