# ChannelExplorer: Visual Analytics at Activation Channel's Granularity

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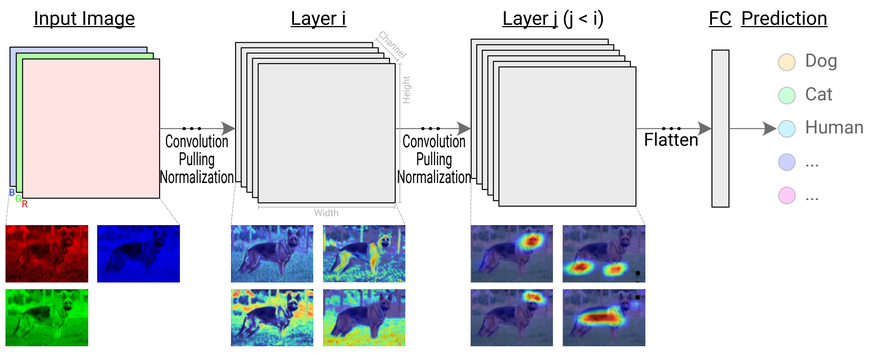
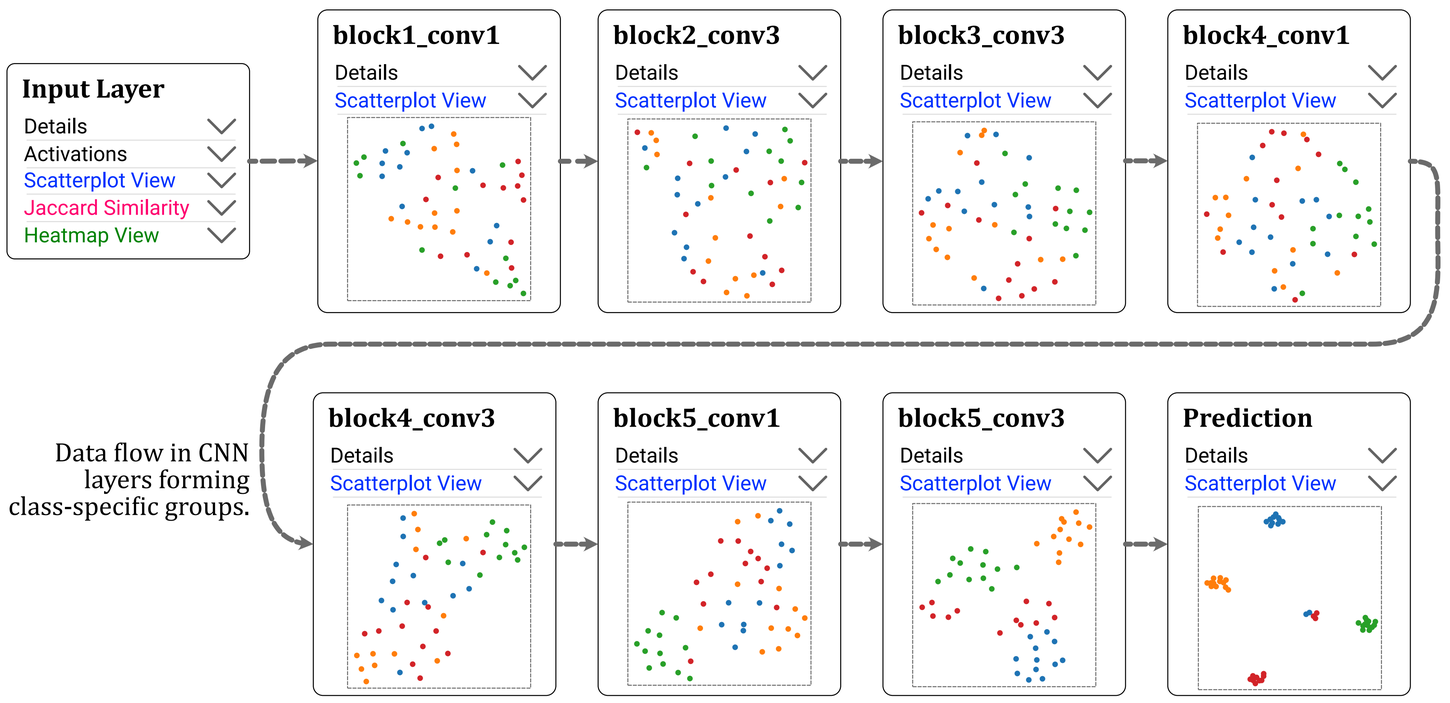
## Introduction and Motivation

Deep Learning models are hard to debug and interpret, especially with the lack of generalized tools.

**This poster introduces ChannelExplorer, a visualization tool that analyzes convolutional deep learning models. Each CNN layer output is divided into slices called channels that is used to produce the visualizations.**



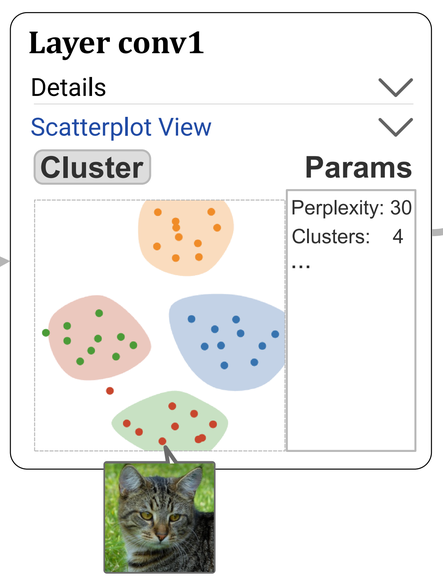

Earlier layers detect basic features; later layers detect complex features.




Data flow in CNN layers forming class-specific groups.

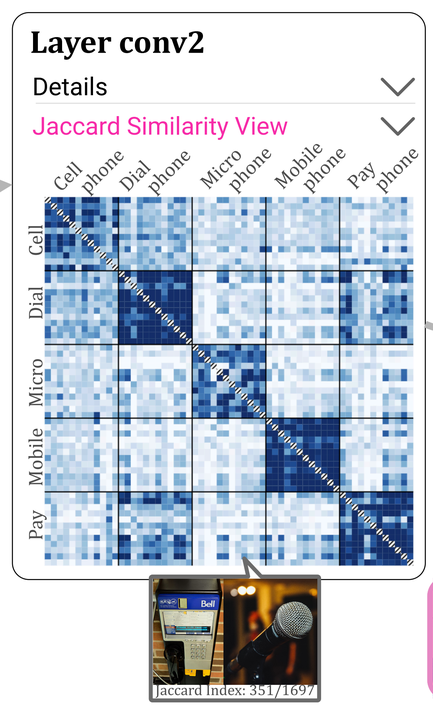
## Methodology

### ScatterPlot View



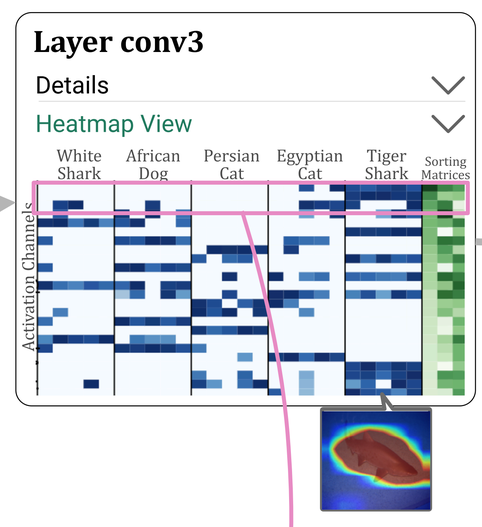

Inputs are projected using **Dimension Reduction** methods, showing different patterns in activation space for different types of inputs.

### Jaccard Similarity View

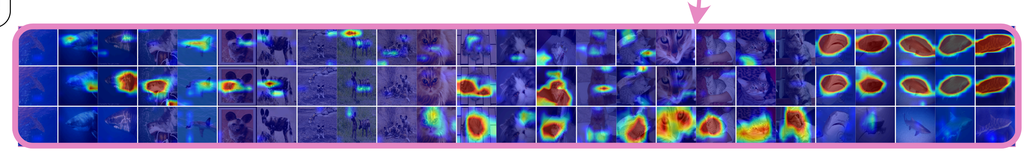



Similarity between activation pattern for multiple inputs are visualized with Jaccard channel similarity.

### Heatmap View



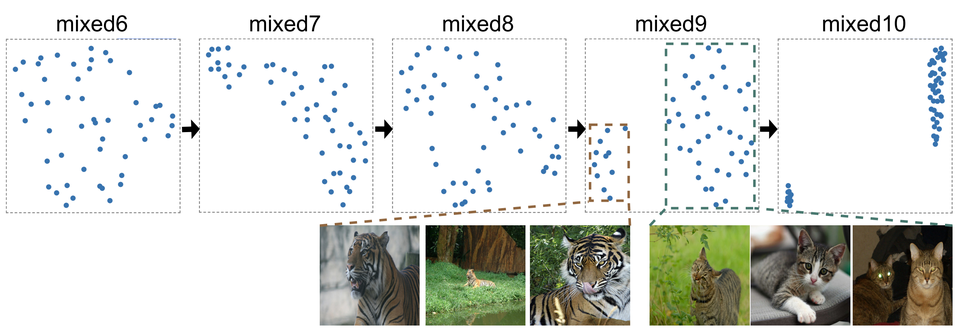

Individual channels for multiple inputs are sorted and visualized using heatmap. Bright stripes indicate filters targeting specific features.



## Findings

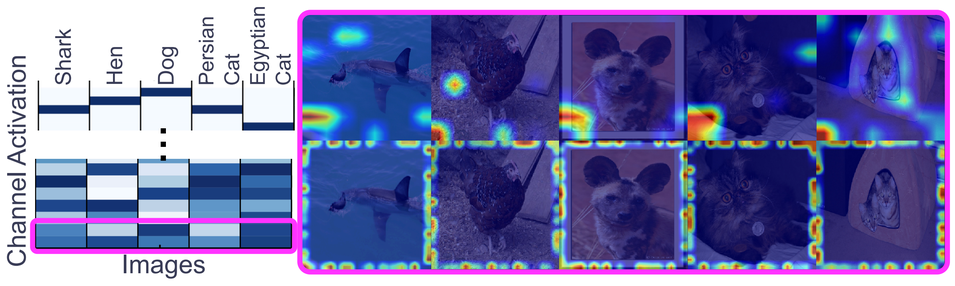
### Mislabel Identification

Scatterplot view of ChannelExplorer shows that a classification dataset have mislabeled inputs. In ImageNet, cats are classified as Tiger Cat.




### Unimportant Channels

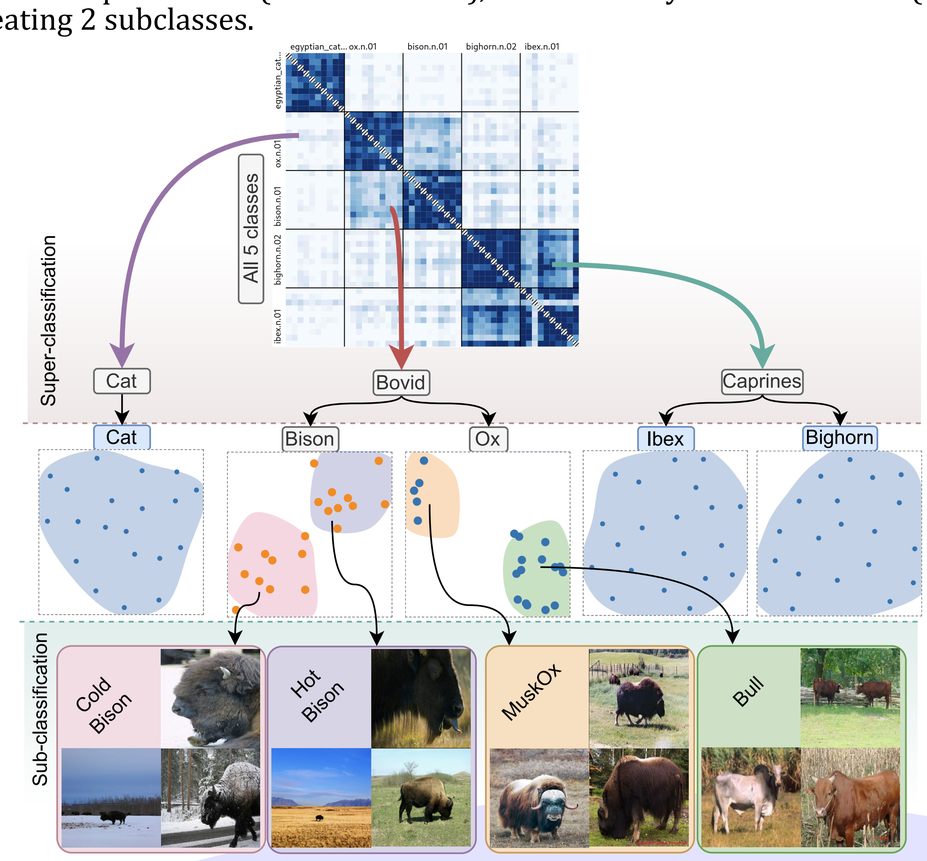
Channels activating for unimportant features - attending to borders of the image.




## Use cases on InceptionV3 & ImageNet

### Hierarchical Classification

Starting from 5 classes, 3 super-classes (Cat, Bovid, and Caprines) are created. In the Bison's Scatter View, two clusters show examples of Bison in Cold & Hot weather. Similarly, Oxen's Scatterplot View shows furry and barrel-shaped bodies (MuskOx breed), and less furry cow-like bodies (Bull); creating 2 subclasses.




**Built with:** Tensorflow, PyTorch, Scikit Learn, Sphinx, Sphinx, BearType, React, Typescript, React-Flow, Redux, FastAPI

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