Paper Title\* (use style: *paper title*)

Michael Meng   
*Department of Electrical and Computer Engineering*  
*Georgia Institute of Technology*City, Country  
mmeng35@gatech.edu  
  
2nd Ziyu Liu  
*Department of Electrical and Computer Engineering*  
*Georgia Institute of Technology*City, Country  
email address or ORCID

*Abstract*—This paper will use four machine learning mythologies for classifying the Diabetic Retinopathy Severity Scale (DRSS) using the OCT images from OLIVES [1] dataset. This projects uses KNN, SVM, Alexnet, and Resnet18. Performances and potential improvements will be discussed in the following stections.

Keywords—component, formatting, style, styling, insert (key words)

# Introduction

Ophthalmology, a branch of eye treatment in medical field, is acquiring new technology of machine learning to predict patient prescriptions and treatments. In this study, we are going to use OLIVE dataset, which contains detailed labeling of DRSS level of data images, to customize a machine learning model and measure predict the disease severity. We classified 7 levels of DRSS scores into 3 DRSS Severity Levels, and outputs of four different models will be used for accuracy comparison.

As no authors in the paper are adept at recognizing OCT images, in particular evaluating the severity of Diabetic Retinopathy [1], heuristics that could be used in conventional image classification do not apply. The question then arises of how to simplify the training process,

# Different Architectures Used

## Naïve Bayes

## Support Vector Machines (SVM)

## Training a New Alexnet

## Transfer Learning on ResNet50

Identify applicable funding agency here. If none, delete this text box.

# Training Methods

## Autoencoder

Due to the size of each frame, the input to the Naïve Bayes and SVM architectures would be millions of dimensions as indicated in equation. This would be far too computationally expensive, both in resources and time to achieve over the length of the .

Therefore, an autoencoder is used to

## Image Pre-Processing

## Flashbulb Memory Training

For both Alexnet and ResNet50 architectures, the model is trained using primarily a single class, then late into the training process a combined 3D-convoluted image made of multiple instances (volumes) of an alternative class is introduced with a higher learning rate, and trains the model for few or one epochs. The method of training is inspired by the psychological phenomenon of “flashbulb memory”(cite) where a person tends to remember a significant/traumatic event far more vividly than they do everyday occurrences. Similarly, from the view of an optometrist who is used to only seeing a certain severity label, say of example level 2, then they may recognize a level 0 instance if they had only met it a rare few times before, as it would be considered a rare example. This can also be generalized into other fields, not optometry and in extension, image processing. Of course, the assumption is made here that the class introduced late into the training process is rare, which may not be the case.

As a neural network mimics the brain via the neuron, connections and activation, this flashbulb memory training method should in theory “shock” the model with the high learning rate integrated in backpropagation of the introduced new class, leaving its “impression” in the weights of the model. An advantage of this training method is that the training time is decreased significantly, as only select examples of an alternative class is needed to train the network rather than using all training datasets in every epoch.

D.

# Results

## Naïve Bayes and SVM

As mentioned previously,

## Training ResNet50 Frame-by-Frame

Prior to gaining an understanding of the OLIVES dataset, the method of ResNet50 with transfer learning was trained frame by frame.

# Discussion

In addition to conventional classification methods using Naïve Bayes, SVMs, and two CNN architectures, Alexnet with re-trained weights and ResNet50 with transfer learning, a new method of flashbulb memory is attempted where a CNN model is initially trained on a single class to become “proficient” at predicting the specific label, then a

Currently, it is expected that the flashbulb memory training method should only work on neural networks that only have an output of few classes.

## Authors and Affiliations

**The template is designed for, but not limited to, six authors.** A minimum of one author is required for all conference articles. Author names should be listed starting from left to right and then moving down to the next line. This is the author sequence that will be used in future citations and by indexing services. Names should not be listed in columns nor group by affiliation. Please keep your affiliations as succinct as possible (for example, do not differentiate among departments of the same organization).

### For papers with more than six authors: Add author names horizontally, moving to a third row if needed for more than 8 authors.

### For papers with less than six authors: To change the default, adjust the template as follows.

#### Selection: Highlight all author and affiliation lines.

#### Change number of columns: Select the Columns icon from the MS Word Standard toolbar and then select the correct number of columns from the selection palette.

#### Deletion: Delete the author and affiliation lines for the extra authors.

## Identify the Headings

Headings, or heads, are organizational devices that guide the reader through your paper. There are two types: component heads and text heads.

Component heads identify the different components of your paper and are not topically subordinate to each other. Examples include Acknowledgments and References and, for these, the correct style to use is “Heading 5”. Use “figure caption” for your Figure captions, and “table head” for your table title. Run-in heads, such as “Abstract”, will require you to apply a style (in this case, italic) in addition to the style provided by the drop down menu to differentiate the head from the text.

Text heads organize the topics on a relational, hierarchical basis. For example, the paper title is the primary text head because all subsequent material relates and elaborates on this one topic. If there are two or more sub-topics, the next level head (uppercase Roman numerals) should be used and, conversely, if there are not at least two sub-topics, then no subheads should be introduced. Styles named “Heading 1”, “Heading 2”, “Heading 3”, and “Heading 4” are prescribed.

## Figures and Tables

#### Positioning Figures and Tables: Place figures and tables at the top and bottom of columns. Avoid placing them in the middle of columns. Large figures and tables may span across both columns. Figure captions should be below the figures; table heads should appear above the tables. Insert figures and tables after they are cited in the text. Use the abbreviation “Fig. 1”, even at the beginning of a sentence.

1. Table Type Styles

| Table Head | Table Column Head | | |
| --- | --- | --- | --- |
| Table column subhead | Subhead | Subhead |
| copy | More table copya |  |  |

1. Sample of a Table footnote. (*Table footnote*)
2. Example of a figure caption. (*figure caption*)

Figure Labels: Use 8 point Times New Roman for Figure labels. Use words rather than symbols or abbreviations when writing Figure axis labels to avoid confusing the reader. As an example, write the quantity “Magnetization”, or “Magnetization, M”, not just “M”. If including units in the label, present them within parentheses. Do not label axes only with units. In the example, write “Magnetization (A/m)” or “Magnetization {A[m(1)]}”, not just “A/m”. Do not label axes with a ratio of quantities and units. For example, write “Temperature (K)”, not “Temperature/K”.

##### Acknowledgment *(Heading 5)*

The preferred spelling of the word “acknowledgment” in America is without an “e” after the “g”. Avoid the stilted expression “one of us (R. B. G.) thanks ...”. Instead, try “R. B. G. thanks...”. Put sponsor acknowledgments in the unnumbered footnote on the first page.

##### References

The template will number citations consecutively within brackets [1]. The sentence punctuation follows the bracket [2]. Refer simply to the reference number, as in [3]—do not use “Ref. [3]” or “reference [3]” except at the beginning of a sentence: “Reference [3] was the first ...”

Number footnotes separately in superscripts. Place the actual footnote at the bottom of the column in which it was cited. Do not put footnotes in the abstract or reference list. Use letters for table footnotes.

Unless there are six authors or more give all authors’ names; do not use “et al.”. Papers that have not been published, even if they have been submitted for publication, should be cited as “unpublished” [4]. Papers that have been accepted for publication should be cited as “in press” [5]. Capitalize only the first word in a paper title, except for proper nouns and element symbols.

For papers published in translation journals, please give the English citation first, followed by the original foreign-language citation [6].

1. M. Prabhushankar, K. Kokilepersaud\*, Y. Logan\*, S. Trejo Corona\*, G. AlRegib, C. Wykoff, "OLIVES Dataset: Ophthalmic Labels for Investigating Visual Eye Semantics," in *Advances in Neural Information Processing Systems (NeurIPS 2022) Track on Datasets and Benchmarks*, New Orleans, LA,, Nov. 29 - Dec. 1 2022
2. J. Clerk Maxwell, A Treatise on Electricity and Magnetism, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68–73.
3. I. S. Jacobs and C. P. Bean, “Fine particles, thin films and exchange anisotropy,” in Magnetism, vol. III, G. T. Rado and H. Suhl, Eds. New York: Academic, 1963, pp. 271–350.
4. K. Elissa, “Title of paper if known,” unpublished.
5. R. Nicole, “Title of paper with only first word capitalized,” J. Name Stand. Abbrev., in press.
6. Y. Yorozu, M. Hirano, K. Oka, and Y. Tagawa, “Electron spectroscopy studies on magneto-optical media and plastic substrate interface,” IEEE Transl. J. Magn. Japan, vol. 2, pp. 740–741, August 1987 [Digests 9th Annual Conf. Magnetics Japan, p. 301, 1982].
7. M. Young, The Technical Writer’s Handbook. Mill Valley, CA: University Science, 1989.

**IEEE conference templates contain guidance text for composing and formatting conference papers. Please ensure that all template text is removed from your conference paper prior to submission to the conference. Failure to remove template text from your paper may result in your paper not being published.**

1. M. Prabhushankar, K. Kokilepersaud\*, Y. Logan\*, S. Trejo Corona\*, G. AlRegib, C. Wykoff, "OLIVES Dataset: Ophthalmic Labels for Investigating Visual Eye Semantics," in *Advances in Neural Information Processing Systems (NeurIPS 2022) Track on Datasets and Benchmarks*, New Orleans, LA,, Nov. 29 - Dec. 1 2022

Brown, R., & Kulik, J. (1977). Flashbulb memories. *Cognition, 5*(1), 73–99. [https://doi.org/10.1016/0010-0277(77)90018-X](https://psycnet.apa.org/doi/10.1016/0010-0277(77)90018-X)