

AUTOMATICALLY DISTINGUISHING BETWEEN SUNSET AND NON-SUNSET SCENES USING MACHINE LEARNING

Nicholas Kamper and Eric Henderson

Rose-Hulman Institute of Technology

Email: kampernj@rose-hulman.edu and henderea@rose-hulman.edu

ABSTRACT

The abstract should appear at the top of the left-hand column of text, about 0.5 inch (12 mm) below the title area and no more than 3.125 inches (80 mm) in length. Leave a 0.5 inch (12 mm) space between the end of the abstract and the beginning of the main text. The abstract should contain 2000 characters maximum, and should be identical to the abstract of the manuscript submitted electronically. All manuscripts must be in English and printed in black ink.

Keywords— sunset detector, scene classification, support vector machine, image classification

1. INTRODUCTION

For the sunset detector project, we set out to devise an accurate way to classify whether a given image is a sunset or not using supervised machine learning techniques.

Scene classification has several practical applications. One such use is in consumer imaging devices to determine the best post-processing steps to deliver a high quality image. Another would be automated image sorting based on the scene type (e.g., being able to classify portraits, nature shots, and so on, to categorize them in an album).

Scene classification is difficult, even in the binary case that we consider in this paper. Certain scenes would be very difficult to classify, as they would share the same characteristics, such as hue and brightness features, as other scenes.

2. TITLE PAGE

The paper title (on the first page) should begin 1.38 inches (35 mm) from the top edge of the page, centered, completely capitalized, and in Times 14-point, boldface type. Your name and affiliation should be included for this camera-ready submission.

2.1. L^AT_EX Users

If you are using L^AT_EX, make sure Line 17 of “Template.tex” is uncommented when generating your camera-ready paper. The authors’ name(s) and affiliation(s) should appear in the camera-ready submission. In this case simply key in the authors’ names and affiliations in line 40 if you are using L^AT_EX.

2.2. Microsoft Word Users

If you are using Microsoft Word, please enter your name and affiliation below the title of your paper.

3. COPYRIGHT NOTICE

The appropriate copyright notice should appear at the bottom of the first page of each paper. For L^AT_EX users, you can change this at Line 48 of the “Template.tex” file.

3.1. Authors employed by the US government

For papers in which all authors are employed by the US government, the notice is “U.S. Government work not protected by U.S. copyright”.

3.2. Authors employed by a Crown government

For papers in which all authors are employed by a Crown government (U.K., Canada and Australia), the notice is “978-1-4244-7493-6/10/\$26.00 ©2010 Crown”.

3.3. All other papers

For all other papers, the notice is “978-1-4244-7493-6/10/\$26.00 ©2010 IEEE”.

3.4. Copyright Forms

You must include your fully completed IEEE copyright release form when you submit your camera-ready paper. This form must be completed *electronically* and submitted via the ICME2010 paper submission system before your paper can be published in the proceedings. Details of electronic copyright form submission can be found on the website <http://www.icme2010.org/authorguide.html>.

4. TYPE-STYLE AND FONTS

To achieve the best rendering both in the proceedings and from the CD-ROM, you are strongly encouraged to use Times New Roman font. In addition, this will give the proceedings a more uniform look. Use a font that is no smaller than nine point type throughout the paper, including figure captions.

In nine point type font, capital letters are 2 mm high. If you use the smallest point size, there should be no more than 3.2 lines/cm (8 lines/inch) vertically. This is a minimum spacing; 2.75 lines/cm (7 lines/inch) will make the paper much more readable. Larger type sizes require correspondingly larger vertical spacing. Please adhere to the vertical spacing of this template and do not double-space your paper. True-Type 1 fonts are preferred.

The first paragraph in each section should not be indented, but all the following paragraphs within the section should be indented as these paragraphs demonstrate.

4.1. Embedding Fonts

All submissions must be in PDF. It is important to make sure that all fonts are embedded. This will ensure that reviewers will be able to read your manuscript independent of his/her system. You should check if all your fonts are embedded via Adobe Acrobat under the following menu “*File>Properties>Fonts.*” If any fonts are not embedded, start your Acrobat Distiller then “*Settings>Job Options>Fonts>Embed All Fonts.*”

Alternatively, if you are using Acrobat Professional, go to “*Edit>Preferences>Convert to PDF>Microsoft Office Word>Edit Settings>Edit>Fonts.*” Then make sure all the fonts listed in the “*Font Source*” dialogue box is added to the “*Always Embed*” dialogue box. Finally click “*Save As...*” and give it a file name. The next time you print any figures or text to PDF via Microsoft Word or Visio, print them using the file name you specified. This file name can be specified under “*Properties*” in printing settings.

5. MAJOR HEADINGS

Major headings, for example, “1. Introduction”, should appear in all capital letters, bold face if possible, centered in the column, with one blank line before, and one blank line after. Use a period (“.”) after the heading number, not a colon. For \LaTeX users, section numberings will automatically be formatted.

5.1. Subheadings

Subheadings should appear in lower case (initial word capitalized) in boldface. They should start at the left margin on a separate line.

5.1.1. Sub-subheadings

Sub-subheadings, as in this paragraph, are strongly discouraged. However, if you must use them, they should appear in lower case (initial word capitalized) and start at the left margin on a separate line, with paragraph text beginning on the following line. They should be in italics.

(a) Result 1

(b) Results 2

(c) Result 3

Fig. 1. Example of placing a figure with experimental results.

6. LENGTH

All papers must not exceed *six* pages. Over-length papers will not be published. Note that all pages must adhere to the margins described in Section ??.

7. PAPER SUBMISSION AND FILENAME

All papers must be printed to PDF. This means that you should print your manuscript to PDF regardless of whether you are using \LaTeX or Microsoft Word Template.

In addition, all camera-ready PDFs *must be* IEEE Xplore-compatible. To check whether your PDF file is IEEE Xplore-compatible, please visit www.pdf-express.org/. You can also use the above link to convert your source file(s) to IEEE Xplore-compatible PDF. The “Conference ID” is “icme10x”.

Please remember to upload the PDF generated from PDF eXpress to the ICME 2010 submission site. The filename *must be* in the form of “xxxx.pdf” where “xxxx” are the four-digit Paper ID.

8. PAGE NUMBERING

Please do **not** paginate your paper. Page numbers, session numbers, and conference identification will be inserted when the paper is included in the proceedings.

9. ILLUSTRATIONS, GRAPHS, AND PHOTOGRAPHS

Illustrations must appear within the designated margins. They may span the two columns. If possible, position illustrations at the top of the columns, rather than in the middle or at the bottom. Caption and number every illustration. All halftone illustrations must be clear black and white prints.

Since there are many ways, often incompatible, of including images (e.g., with experimental results) in a \LaTeX document. Figure 1 shows you an example of how to do this.

Table 1. Table caption

Column One	Column Two	Column Three
Cell 1	Cell 2	Cell 3
Cell 4	Cell 5	Cell 6

10. TABLES AND EQUATIONS

Tables and important equations must be centered in the column. Table 1 shows an example of a table while the equation

$$\begin{aligned}y &= ax^2 + bx + c \\ &= (x + p)(x + q)\end{aligned}\tag{1}$$

shows an example of an equation layout.

Large tables or long equations may span across both columns. Any table or equation that takes up more than one column width must be positioned either at the top or at the bottom of the page.

11. FOOTNOTES

Use footnotes sparingly and write them at the bottom of the column on the page where they are referenced. Use Times New Roman 9-point type, single-spaced. To help your readers, avoid using footnotes altogether but include any necessary observations in the text (within parentheses, if you prefer, as in this sentence).

12. CITATIONS AND REFERENCES

Citation of your own work is now allowed in this camera-ready submission. You can now use phrases such as “*In previous works [20], we have proposed...*”

List and number all bibliographical references at the end of the paper. The references can be numbered in alphabetic order or in order of appearance in the document. When referring to them in the text, type the corresponding reference number in square brackets as shown at the end of this sentence. All citations must be adhered to IEEE format and style. Examples such as [1], [2] and [3] are given in Section 14.

13. REFERENCES

- [1] Dennis R. Morgan, “Dos and don’ts of technical writing,” *IEEE Potentials*, vol. 24, no. 3, pp. 22–25, Aug. 2005.
- [2] J. W. Cooley and J. W. Tukey, “An algorithm for the machine computation of complex Fourier series,” *Math. Comp.*, vol. 19, pp. 297–301, Apr. 1965.
- [3] S. Haykin, “Adaptive filter theory,” Information and System Science. Prentice Hall, 4th edition, 2002.