[[1]](#footnote-1)

**Formula 1 Result Optimization: Team Red Bull** (March 2023)

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*Abstract*—According to Statista, half a billion people watch Formula 1 races. We can infer that betting on the results of these races is a well-liked activity given the volume of spectators these events receive. We sought to find insights in this study to see if it was possible to predict the winners of each race. The objective was to examine recent and prior data for a specific Formula 1 team and driver in order to identify any correlations that might affect finishes.

To monitor drivers, teams, and race results over time, we developed a database. The website <http://ergast.com/mrd/> was used to collect the data. and thoroughly examined [1]. We looked at the relationships between variables like the weather, nationality, track region, etc. and used various statistical techniques to develop prediction models. The results demonstrate that, despite the difficulty of predicting the winner of the races with the data we had, winners may be predicted with a fair degree of accuracy thanks to the randomness of unknown variables. Predictions should rise along with technological and Formula 1 developments.

*Index Terms*—Accuracy, Betting, Database, Formula One, Predictive Modeling

# INTRODUCTION

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ith over 4.3 billion dollars in revenue from sports betting in 2021 alone, F1 racing has sparked tremendous interest across the globe. It is essential to offer a lower risk percentage to individuals who wager on F1 races given the huge sum of money involved. Building and using a prediction model to reliably forecast race finishes is one technique to accomplish this. With over 4.3 billion dollars in revenue from sports betting in 2021 alone, F1 racing has sparked tremendous interest across the globe. It is essential to offer a lower risk percentage to individuals who wager on F1 races given the huge sum of money involved. Building and using a prediction model to reliably forecast race finishes is one technique to accomplish this. Our goal was to develop a prediction model that would perform better than existing models and offer bettors more reliable predictions. In order to accomplish this, we gathered statistics on recent and past F1 races, as well as details on other elements that can affect the results. We developed a database to store and arrange this substantial amount of data.

The prediction model we created has the ability to deliver forecasts for F1 race finishes that are more precise than existing models. We can forecast the likelihood of certain race outcomes by examining multiple parameters like car specifications, driver performance, and team rankings. The predictive model offers a more complete picture of the race by taking into account variables like track conditions, weather, and tire kinds. With this knowledge, gamblers can make wise choices that lower their overall risk. Our ultimate goal is to increase the reliability of F1 race predictions and offer enthusiasts a more secure betting environment.

Since F1 racing is a highly competitive sport, data management must be precise and effective. For the management of F1 racing to be effective, a database system must be created due to the growing requirement for better data storage and retrieval. The arrangement of multiple data points, such as driver performance, vehicle specifications, and team standings, can be facilitated by a database system, making it simpler to evaluate and derive insightful conclusions. A database can also be used to track race results, team standings, and other crucial data, assisting F1 teams in making strategic and tactical decisions. This study examines the many components of developing a database system for Formula One racing and emphasizes the value of data management in this fiercely competitive sport.

# Data collection

In order to build a database for any sport, including Formula One racing, data collection is essential. The Ergast data repository is a thorough archive of past F1 race data that includes data on drivers, lap timings, and finish positions. For those of us trying to create forecasting models for F1 race outcomes, this library is a crucial resource. The world championship started in 1950, and "the Ergast Developer API provides a historical record of motor racing data." Our ability to recognize patterns and associations that would be challenging to find manually is made possible by data mining techniques, which may be utilized to extract insightful information from this data. The data we collected included information such as driver and team standings, car specifications, and race results. We also gathered data on track information, weather conditions, and tire types for each race. This information was stored in a structured format in our database to facilitate data analysis.

Data mining is an important tool for predicting F1 race finishes, as it enables us to identify hidden relationships between various factors that can impact the outcome of a race. For example, by analyzing past races and driver performance, we can identify correlations between lap times and tire types, helping them make predictions about future races. Moreover, data mining can help in the identification of previously unknown patterns or relationships, providing new insights that can aid in the development of more accurate prediction models. The use of data mining techniques in F1 race prediction is a rapidly growing field, with researchers continually seeking new ways to analyze data and gain insights that will enable them to make more accurate predictions. The Ergast data repository is an invaluable resource for data mining in F1, providing us with a rich source of historical data that can be used to identify trends and relationships that will improve the accuracy of F1 race predictions.

To insert images in *Word,* position the cursor at the insertion point and either use Insert | Picture | From File or copy the image to the Windows clipboard and then Edit | Paste Special | Picture (with “float over text” unchecked).

IEEE will do the final formatting of your paper. If your paper is intended for a conference, please observe the conference page limits.

## Abbreviations and Acronyms

Define abbreviations and acronyms the first time they are used in the text, even after they have already been defined in the abstract. Abbreviations such as IEEE, SI, ac, and dc do not have to be defined. Abbreviations that incorporate periods should not have spaces: write “C.N.R.S.,” not “C. N. R. S.” Do not use abbreviations in the title unless they are unavoidable (for example, “IEEE” in the title of this article).

## Other Recommendations

Use one space after periods and colons. Hyphenate complex modifiers: “zero-field-cooled magnetization.” Avoid dangling participles, such as, “Using (1), the potential was calculated.” [It is not clear who or what used (1).] Write instead, “The potential was calculated by using (1),” or “Using (1), we calculated the potential.”

Use a zero before decimal points: “0.25,” not “.25.” Use “cm3,” not “cc.” Indicate sample dimensions as “0.1 cm × 0.2 cm,” not “0.1 × 0.2 cm2.” The abbreviation for “seconds” is “s,” not “sec.” Use “Wb/m2” or “webers per square meter,” not “webers/m2.” When expressing a range of values, write “7 to 9” or “7-9,” not “7~9.”

A parenthetical statement at the end of a sentence is punctuated outside of the closing parenthesis (like this). (A parenthetical sentence is punctuated within the parentheses.) In American English, periods and commas are within quotation marks, like “this period.” Other punctuation is “outside”! Avoid contractions; for example, write “do not” instead of “don’t.” The serial comma is preferred: “A, B, and C” instead of “A, B and C.”

If you wish, you may write in the first person singular or plural and use the active voice (“I observed that ...” or “We observed that ...” instead of “It was observed that ...”). Remember to check spelling. If your native language is not English, please get a native English-speaking colleague to carefully proofread your paper.

## How to Create a PostScript File

First, download a PostScript printer driver from <http://www.adobe.com/support/downloads/pdrvwin.htm> (for Windows) or from [http://www.adobe.com/support/downloads/ pdrvmac.htm](http://www.adobe.com/support/downloads/) (for Macintosh) and install the “Generic PostScript Printer” definition. In *Word,* paste your figure into a new document. Print to a file using the PostScript printer driver. File names should be of the form “fig5.ps.” Use Open Type fonts when creating your figures, if possible. A listing of the acceptable fonts are as follows: Open Type Fonts: Times Roman, Helvetica, Helvetica Narrow, Courier, Symbol, Palatino, Avant Garde, Bookman, Zapf Chancery, Zapf Dingbats, and New Century Schoolbook.

# MATH

If you are using *Word,* use either the Microsoft Equation Editor or the *MathType* add-on (http://www.mathtype.com) for equations in your paper (Insert | Object | Create New | Microsoft Equation *or* MathType Equation). “Float over text” should *not* be selected.

## Equations

Number equations consecutively with equation numbers in parentheses flush with the right margin, as in (1). First use the equation editor to create the equation. Then select the “Equation” markup style. Press the tab key and write the equation number in parentheses. To make your equations more compact, you may use the solidus ( / ), the exp function, or appropriate exponents. Use parentheses to avoid ambiguities in denominators. Punctuate equations when they are part of a sentence, as in

 (1)

Be sure that the symbols in your equation have been defined before the equation appears or immediately following. Italicize symbols (*T* might refer to temperature, but T is the unit tesla). Refer to “(1),” not “Eq. (1)” or “equation (1),” except at the beginning of a sentence: “Equation (1) is ... .”

# Units

Use either SI (MKS) or CGS as primary units. (SI units are strongly encouraged.) English units may be used as secondary units (in parentheses). This applies to papers in data storage**.** For example, write “15 Gb/cm2 (100 Gb/in2).” An exception is when English units are used as identifiers in trade, such as “3½-in disk drive.” Avoid combining SI and CGS units, such as current in amperes and magnetic field in oersteds. This often leads to confusion because equations do not balance dimensionally. If you must use mixed units, clearly state the units for each quantity in an equation.

The SI unit for magnetic field strength *H* is A/m. However, if you wish to use units of T, either refer to magnetic flux density *B* or magnetic field strength symbolized as µ0*H*. Use the center dot to separate compound units, e.g., “A·m2.”

# Some Common Mistakes

The word “data” is plural, not singular. The subscript for the permeability of vacuum µ0 is zero, not a lowercase letter “o.” The term for residual magnetization is “remanence”; the adjective is “remanent”; do not write “remnance” or “remnant.” Use the word “micrometer” instead of “micron.” A graph within a graph is an “inset,” not an “insert.” The word “alternatively” is preferred to the word “alternately” (unless you really mean something that alternates). Use the word “whereas” instead of “while” (unless you are referring to simultaneous events). Do not use the word “essentially” to mean “approximately” or “effectively.” Do not use the word “issue” as a euphemism for “problem.” When compositions are not specified, separate chemical symbols by en-dashes; for example, “NiMn” indicates the intermetallic compound Ni0.5Mn0.5 whereas “Ni–Mn” indicates an alloy of some composition NixMn1-x.

Be aware of the different meanings of the homophones “affect” (usually a verb) and “effect” (usually a noun), “complement” and “compliment,” “discreet” and “discrete,” “principal” (e.g., “principal investigator”) and “principle” (e.g., “principle of measurement”). Do not confuse “imply” and “infer.”

Prefixes such as “non,” “sub,” “micro,” “multi,” and “ultra” are not independent words; they should be joined to the words they modify, usually without a hyphen. There is no period after the “et” in the Latin abbreviation “*et al.*” (it is also italicized). The abbreviation “i.e.,” means “that is,” and the abbreviation “e.g.,” means “for example” (these abbreviations are not italicized).

A general IEEE styleguide is available at <http://www.ieee.org/web/publications/authors/transjnl/index.html>



Fig. 1. Magnetization as a function of applied field. Note that “Fig.” is abbreviated. There is a period after the figure number, followed by two spaces. It is good practice to explain the significance of the figure in the caption.

TABLE I

Units for Magnetic Properties

|  |  |  |
| --- | --- | --- |
| Symbol | Quantity | Conversion from Gaussian and  CGS EMU to SI a |
| Φ | magnetic flux | 1 Mx → 10−8 Wb = 10−8 V·s |
| *B* | magnetic flux density,  magnetic induction | 1 G → 10−4 T = 10−4 Wb/m2 |
| *H* | magnetic field strength | 1 Oe → 103/(4π) A/m |
| *m* | magnetic moment | 1 erg/G = 1 emu  → 10−3 A·m2 = 10−3 J/T |
| *M* | magnetization | 1 erg/(G·cm3) = 1 emu/cm3  → 103 A/m |
| 4π*M* | magnetization | 1 G → 103/(4π) A/m |
| σ | specific magnetization | 1 erg/(G·g) = 1 emu/g → 1 A·m2/kg |
| *j* | magnetic dipole  moment | 1 erg/G = 1 emu  → 4π × 10−10 Wb·m |
| *J* | magnetic polarization | 1 erg/(G·cm3) = 1 emu/cm3  → 4π × 10−4 T |
| χ*,* κ | susceptibility | 1 → 4π |
| χρ | mass susceptibility | 1 cm3/g → 4π × 10−3 m3/kg |
| μ | permeability | 1 → 4π × 10−7 H/m  = 4π × 10−7 Wb/(A·m) |
| μr | relative permeability | μ → μr |
| *w, W* | energy density | 1 erg/cm3 → 10−1 J/m3 |
| *N, D* | demagnetizing factor | 1 → 1/(4π) |

Vertical lines are optional in tables. Statements that serve as captions for the entire table do not need footnote letters.

aGaussian units are the same as cg emu for magnetostatics; Mx = maxwell, G = gauss, Oe = oersted; Wb = weber, V = volt, s = second, T = tesla, m = meter, A = ampere, J = joule, kg = kilogram, H = henry.

# Guidelines for Graphics Preparation and Submission

## Types of Graphics

The following list outlines the different types of graphics published in IEEE journals. They are categorized based on their construction, and use of color / shades of gray:

### *Color/Grayscale figures*

### Figures that are meant to appear in color, or shades of black/gray. Such figures may include photographs, illustrations, multicolor graphs, and flowcharts.

### *Lineart figures*

### Figures that are composed of only black lines and shapes. These figures should have no shades or half-tones of gray. Only black and white.

### *Author photos*

### Head and shoulders shots of authors which appear at the end of our papers.

### *Tables* Data charts which are typically black and white, but sometimes include color.

## Multipart figures

Figures compiled of more than one sub-figure presented side-by-side, or stacked. If a multipart figure is made up of multiple figure types (one part is lineart, and another is grayscale or color) the figure should meet the stricter guidelines.

## File Formats For Graphics

Format and save your graphics using a suitable graphics processing program that will allow you to create the images as PostScript (PS), Encapsulated PostScript (.EPS), Tagged Image File Format (.TIFF), Portable Document Format (.PDF), or Portable Network Graphics (.PNG) sizes them, and adjusts the resolution settings. If you created your source files in one of the following programs you will be able to submit the graphics without converting to a PS, EPS, TIFF, PDF, or PNG file: Microsoft Word, Microsoft PowerPoint, or Microsoft Excel. Though it is not required, it is recommended that these files be saved in PDF format rather than DOC, XLS, or PPT. Doing so will protect your figures from common font and arrow stroke issues that occur when working on the files across multiple platforms. When submitting your final paper, your graphics should all be submitted individually in one of these formats along with the manuscript.

## Sizing of Graphics

Most charts, graphs, and tables are one column wide (3.5 inches / 88 millimeters / 21 picas) or page wide (7.16 inches / 181 millimeters / 43 picas). The maximum depth a graphic can be is 8.5 inches (216 millimeters / 54 picas). When choosing the depth of a graphic, please allow space for a caption. Figures can be sized between column and page widths if the author chooses, however it is recommended that figures are not sized less than column width unless when necessary.

There is currently one publication with column measurements that don’t coincide with those listed above. Proceedings of the IEEE has a column measurement of 3.25 inches (82.5 millimeters / 19.5 picas).

The final printed size of author photographs is exactly   
1 inch wide by 1.25 inches tall (25.4 millimeters x 31.75 millimeters / 6 picas x 7.5 picas). Author photos printed in editorials measure 1.59 inches wide by 2 inches tall (40 millimeters x 50 millimeters / 9.5 picas x 12 picas).

## Resolution

The proper resolution of your figures will depend on the type of figure it is as defined in the “Types of Figures” section. Author photographs, color, and grayscale figures should be at least 300dpi. Lineart, including tables should be a minimum of 600dpi.

## Vector Art

While IEEE does accept, and even recommends that authors submit artwork in vector format, it is our policy is to rasterize all figures for publication. This is done in order to preserve the figures’ integrity across multiple computer platforms.

## Color Space

The term color space refers to the entire sum of colors that can be represented within the said medium. For our purposes, the three main color spaces are Grayscale, RGB (red/green/blue) and CMYK (cyan/magenta/yellow/black). RGB is generally used with on-screen graphics, whereas CMYK is used for printing purposes.

All color figures should be generated in RGB or CMYK color space. Grayscale images should be submitted in Grayscale color space. Line art may be provided in grayscale OR bitmap colorspace. Note that “bitmap colorspace” and “bitmap file format” are not the same thing. When bitmap color space is selected, .TIF/.TIFF is the recommended file format.

## Accepted Fonts Within Figures

When preparing your graphics IEEE suggests that you use of one of the following Open Type fonts: Times New Roman, Helvetica, Arial, Cambria, and Symbol. If you are supplying EPS, PS, or PDF files all fonts must be embedded. Some fonts may only be native to your operating system; without the fonts embedded, parts of the graphic may be distorted or missing.

A safe option when finalizing your figures is to strip out the fonts before you save the files, creating “outline” type. This converts fonts to artwork what will appear uniformly on any screen.

## Using Labels Within Figures

### Figure Axis labels

Figure axis labels are often a source of confusion. Use words rather than symbols. As an example, write the quantity “Magnetization,” or “Magnetization *M*,” not just “*M*.” Put units in parentheses. Do not label axes only with units. As in Fig. 1, for example, write “Magnetization (A/m)” or “Magnetization (Am−1),” not just “A/m.” Do not label axes with a ratio of quantities and units. For example, write “Temperature (K),” not “Temperature/K.”

Multipliers can be especially confusing. Write “Magnetization (kA/m)” or “Magnetization (103 A/m).” Do not write “Magnetization (A/m) × 1000” because the reader would not know whether the top axis label in Fig. 1 meant 16000 A/m or 0.016 A/m. Figure labels should be legible, approximately 8 to 10 point type.

### Subfigure Labels in Multipart Figures and Tables

Multipart figures should be combined and labeled before final submission. Labels should appear centered below each subfigure in 8 point Times New Roman font in the format of (a) (b) (c).

## File Naming

Figures (line artwork or photographs) should be named starting with the first 5 letters of the author’s last name. The next characters in the filename should be the number that represents the sequential location of this image in your article. For example, in author “Anderson’s” paper, the first three figures would be named ander1.tif, ander2.tif, and ander3.ps.

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you do not need to position figures and tables at the top and bottom of each column. In fact, all figures, figure captions, and tables can be placed at the end of your paper. In addition to, or even in lieu of submitting figures within your final manuscript, figures should be submitted individually, separate from the manuscript in one of the file formats listed above in section VI-J. Place figure captions below the figures; place table titles above the tables. Please do not include captions as part of the figures, or put them in “text boxes” linked to the figures. Also, do not place borders around the outside of your figures.

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# Conclusion

## A conclusion section is not required. Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extensions.

Appendix

Appendixes, if needed, appear before the acknowledgment.

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The preferred spelling of the word “acknowledgment” in American English is without an “e” after the “g.” Use the singular heading even if you have many acknowledgments. Avoid expressions such as “One of us (S.B.A.) would like to thank ... .” Instead, write “F. A. Author thanks ... .” In most cases, sponsor and financial support acknowledgments are placed in the unnumbered footnote on the first page, not here.

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References need not be cited in text. When they are, number citations on the line, in square brackets inside the punctuation. Multiple references are each numbered with separate brackets. When citing a section in a book, please give the relevant page numbers. In text, refer simply to the reference number. Do not use “Ref.” or “reference” except at the beginning of a sentence: “Reference [3] shows ... .” Please do not use automatic endnotes in *Word*, rather, type the reference list at the end of the paper using the “References” style.

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## Footnotes

Number footnotes separately in superscripts (Insert | Footnote).[[2]](#footnote-2) Place the actual footnote at the bottom of the column in which it is cited; do not put footnotes in the reference list (endnotes). Use letters for table footnotes (see Table I).

# Submitting Your Paper for Review

## Review Stage Using Word 6.0 or Higher

If you want to submit your file with one column electronically, please do the following:

--First, click on the View menu and choose Print Layout.

--Second, place your cursor in the first paragraph. Go to the Format menu, choose Columns, choose one column Layout, and choose “apply to whole document” from the dropdown menu.

--Third, click and drag the right margin bar to just over 4 inches in width.

The graphics will stay in the “second” column, but you can drag them to the first column. Make the graphic wider to push out any text that may try to fill in next to the graphic.

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2. The length of a submitted paper should be commensurate with the importance, or appropriate to the complexity, of the work. For example, an obvious extension of previously published work might not be appropriate for publication or might be adequately treated in just a few pages.
3. Authors must convince both peer reviewers and the editors of the scientific and technical merit of a paper; the standards of proof are higher when extraordinary or unexpected results are reported.
4. Because replication is required for scientific progress, papers submitted for publication must provide sufficient information to allow readers to perform similar experiments or calculations and use the reported results. Although not everything need be disclosed, a paper must contain new, useable, and fully described information. For example, a specimen’s chemical composition need not be reported if the main purpose of a paper is to introduce a new measurement technique. Authors should expect to be challenged by reviewers if the results are not supported by adequate data and critical details.
5. Papers that describe ongoing work or announce the latest technical achievement, which are suitable for presentation at a professional conference, may not be appropriate for publication.

References

*Basic format for books:*

1. <https://www.statista.com/statistics/480129/cable-or-broadcast-tv-networks-formula-one-f1-racing-watched-within-the-last-12-months-usa/>
2. USA: Abbrev. of Publisher, year, ch. *x*, sec. *x*, pp. *xxx–xxx.*

*Examples:*

1. G. O. Young, “Synthetic structure of industrial plastics,” in *Plastics,* 2nd ed., vol. 3, J. Peters, Ed. New York: McGraw-Hill, 1964, pp. 15–64.
2. W.-K. Chen, *Linear Networks and Systems.* Belmont, CA: Wadsworth, 1993, pp. 123–135.

*Basic format for periodicals:*

1. J. K. Author, “Name of paper,” *Abbrev. Title of Periodical*, vol. *x,* no. *x,* pp*. xxx-xxx,* Abbrev. Month, year.

*Examples:*

1. J. U. Duncombe, “Infrared navigation—Part I: An assessment   
   of feasibility,” *IEEE Trans. Electron Devices*, vol. ED-11, no. 1, pp. 34–39, Jan. 1959.
2. E. P. Wigner, “Theory of traveling-wave optical laser,” *Phys. Rev*.,   
   vol. 134, pp. A635–A646, Dec. 1965.
3. E. H. Miller, “A note on reflector arrays,” *IEEE Trans. Antennas Propagat*., to be published.

*Basic format for reports:*

1. J. K. Author, “Title of report,” Abbrev. Name of Co., City of Co., Abbrev. State, Rep. *xxx*, year.

*Examples:*

1. E. E. Reber, R. L. Michell, and C. J. Carter, “Oxygen absorption in the earth’s atmosphere,” Aerospace Corp., Los Angeles, CA, Tech. Rep. TR-0200 (4230-46)-3, Nov. 1988.
2. J. H. Davis and J. R. Cogdell, “Calibration program for the 16-foot antenna,” Elect. Eng. Res. Lab., Univ. Texas, Austin, Tech. Memo. NGL-006-69-3, Nov. 15, 1987.

*Basic format for handbooks:*

1. *Name of Manual/Handbook*, *x* ed., Abbrev. Name of Co., City of Co., Abbrev. State, year, pp. *xxx-xxx.*

*Examples:*

1. *Transmission Systems for Communications*, 3rd ed., Western Electric Co., Winston-Salem, NC, 1985, pp. 44–60.
2. *Motorola Semiconductor Data Manual*, Motorola Semiconductor Products Inc., Phoenix, AZ, 1989.

*Basic format for books (when available online):*

1. Author. (year, month day). *Title.* (edition) [Type of medium]. *volume (issue).* Available: site/path/file

*Example:*

1. J. Jones. (1991, May 10). *Networks.* (2nd ed.) [Online]. Available: [http://www.atm.com](http://www.atm.com/)

*Basic format for journals (when available online):*

1. Author. (year, month). Title. *Journal.* [Type of medium]. *volume (issue),* pages. Available: site/path/file

*Example:*

1. R. J. Vidmar. (1992, Aug.). On the use of atmospheric plasmas as electromagnetic reflectors. *IEEE Trans. Plasma Sci.* [Online]. *21(3),* pp. 876–880. Available:<http://www.halcyon.com/pub/journals/21ps03-vidmar>

*Basic format for papers presented at conferences (when available online):*

1. Author. (year, month). Title. Presented at Conference title. [Type of Medium]. Available: site/path/file

*Example:*

1. PROCESS Corp., MA. Intranets: Internet technologies deployed behind the firewall for corporate productivity. Presented at   
   INET96 Annual Meeting. [Online]. Available: <http://home.process.com/Intranets/wp2.htp>

*Basic format for reports and handbooks (when available online):*

1. Author. (year, month). Title. Comp an y . C ity, State or Country. [Type of Medium]. Available: site/path/file

*Example:*

1. S. L. Tall een. (1996 , Apr . ). The In t r an et Archi -tecture: M a nagi ng i n f o rm at i on i n t h e ne w paradigm. Amdahl Corp., CA. [Online]. Available:<http://www.amdahl.com/doc/products/bsg/intra/infra/html>

*Basic format for computer programs and electronic documents (when available online):* ISO recommends that capitalization follow the accepted practice for the language or script in which the information is given.

*Example:*

1. A. Harriman. (1993, June). Compendium of genealogical software. *Humanist.* [Online]. Available e-mail: [HUMANIST@NYVM.ORG](mailto:HUMANIST@NYVM.ORG) Message: get GENEALOGY REPORT

*Basic format for patents (when available online):*

1. Name of the invention, by inventor’s name. (year, month day). *Patent Number* [Type of medium]. Available: site/path/file

*Example:*

1. Musical toothbrush with adjustable neck and mirror, by L.M.R. Brooks. (1992, May 19). *Patent D 326 189*

[Online]. Available: NEXIS Library: LEXPAT File: DESIGN

*Basic format for conference proceedings (published):*

1. J. K. Author, “Title of paper,” in *Abbreviated Name of Conf.*, City of Conf., Abbrev. State (if given), year, pp. *xxxxxx.*

*Example:*

1. D. B. Payne and J. R. Stern, “Wavelength-switched pas- sively coupled single-mode optical network,” in *Proc. IOOC-ECOC,* 1985,   
   pp. 585–590.

*Example for papers presented at conferences (unpublished):*

1. D. Ebehard and E. Voges, “Digital single sideband detection for interferometric sensors,” presented at the 2nd Int. Conf. Optical Fiber Sensors, Stuttgart, Germany, Jan. 2-5, 1984.

*Basic format for patents:*

1. J. K. Author, “Title of patent,” U.S. Patent *x xxx xxx*, Abbrev. Month, day, year.

*Example:*

1. G. Brandli and M. Dick, “Alternating current fed power supply,”   
   U.S. Patent 4 084 217, Nov. 4, 1978.

*Basic format**for theses (M.S.) and dissertations (Ph.D.):*

1. J. K. Author, “Title of thesis,” M.S. thesis, Abbrev. Dept., Abbrev. Univ., City of Univ., Abbrev. State, year.
2. J. K. Author, “Title of dissertation,” Ph.D. dissertation, Abbrev. Dept., Abbrev. Univ., City of Univ., Abbrev. State, year.

*Examples:*

1. J. O. Williams, “Narrow-band analyzer,” Ph.D. dissertation, Dept. Elect. Eng., Harvard Univ., Cambridge, MA, 1993.
2. N. Kawasaki, “Parametric study of thermal and chemical nonequilibrium nozzle flow,” M.S. thesis, Dept. Electron. Eng., Osaka Univ., Osaka, Japan, 1993.

*Basic format for the most common types of unpublished references:*

1. J. K. Author, private communication, Abbrev. Month, year.
2. J. K. Author, “Title of paper,” unpublished.
3. J. K. Author, “Title of paper,” to be published.

*Examples:*

1. A. Harrison, private communication, May 1995.
2. B. Smith, “An approach to graphs of linear forms,” unpublished.
3. A. Brahms, “Representation error for real numbers in binary computer arithmetic,” IEEE Computer Group Repository, Paper R-67-85.

*Basic format for standards:*

1. *Title of Standard*, Standard number, date.

*Examples:*

1. IEEE Criteria for Class IE Electric Systems, IEEE Standard 308, 1969.
2. Letter Symbols for Quantities, ANSI Standard Y10.5-1968.

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2. It is recommended that footnotes be avoided (except for the unnumbered footnote with the receipt date on the first page). Instead, try to integrate the footnote information into the text. [↑](#footnote-ref-2)