US PLF Style Guide – Extended Abstracts

Authors are required to follow instructions for preparing the final copy of their extended abstract as detailed below and use associated MS Word template document. The reviewers and editors will check the final copy of the extended abstract to ensure that formatting requirements of the first draft have been fully met.

The Editor and Proceedings Committee reserve the right to reject papers that do not substantially meet the instructions below or where the spelling/grammar/US English construction would require considerable work by the Editor to bring the paper up to the standards required for publishing.

# Information and Requirements

* Extended abstracts will be published in [animal scientific proceedings](https://animal-journal.eu/animal-science-proceedings/)
	+ Each will have a unique doi and therefore will be searchable and citable.
	+ Extended abstracts of up to 2 pages (such as this one) will not normally be considered as prior publications but we recommend that they are declared (can be cited) when authors subsequently submit a full paper elsewhere.
	+ Examples of extended abstracts from a previous conference can be found at this [link](https://www.sciencedirect.com/journal/animal-science-proceedings/vol/13/issue/3).
* **Maximum length is 2 journal pages. This is non-negotiable.** For reference/example only (includes title/author list):
	+ Extended abstract with no tables or figures about 1,000 words/journal page.
	+ Extended abstract with one figure or one table (average size) about 900 words/journal page.
	+ Extended abstract with one figure and one table (average size) about 850 words/journal page.
* **Maximum of two figures/tables.** That is, 1 figure and 1 table, or 2 tables, or 2 figures.
* **Maximum of 8 references.** That is, the number of references in the reference section shall not exceed eight. References must be complete. Please double-check this and make sure references that are cited in text are listed in the reference list.
* Must be submitted as a Microsoft Word file.
* US English is required (please no UK English spelling; [more information](https://www.microsoft.com/en-us/microsoft-365-life-hacks/writing/differences-british-american-english)). Authors who are not native English speakers are strongly advised to have their work checked/corrected by a native English speaker before submission.
* There is no flexibility regarding the date for manuscripts to be sent to the publisher. Authors must therefore keep to the deadlines provided.

# Structure

* The structure of the extended abstract is flexible. That is, there are no required Level 1 Headings (please note Level 2 Headings are not permitted), such as, Introduction, Materials and Methods, etc. You can be creative with Level 1 Headings to best communicate your research. There are a few required components for the extended abstract.
* **Required** components:
	+ ***Title*** - Concise and informative; Include the animal species on which the study has been carried out; Exclude the name of the country or of the region where the study took place; Exclude Latin names, if there is a common name; Exclude non-standard abbreviations.
	+ ***Authors*** - First and middle name as initial(s). Family name spelled out.
	+ ***Affiliation*** - Department, Institution/Organization, Place (e.g., City, State), Country
	+ ***Corresponding*** ***author*** - First and family name. Email address. Only ONE corresponding author should be listed and should be the presenting author.
	+ ***Keywords*** - Maximum of 6, alphabetical order, separated with commas
	+ ***Implications*** (must be the first Level 1 Heading after keywords) – Maximum of 100 words. This should provide a clear and concise summary and/or description of the impact and value of results will have for the intended audience.
* Potential headings (after Implications) could be but are not limited to (authors are free use any Level 1 headings):
	+ *Introduction* - Concise background information and/or clear statement of the current issue and/or research question the work will address. Include clear and complete statement(s) of the specific objectives.
	+ *Materials and Methods* - Concise description of how the data was collected, analyzed, and interpreted.
	+ *Results and Discussion* - A clear description of the results and deliverables.
	+ *Conclusions and Implications* - A clear and concise summary and/or description of the impact and value of results will have for the intended audience.
	+ *Acknowledgements* - Acknowledge those that contributed, include funding sources, and ethical research statements.
	+ *References* - Maximum of 8 references, see formatting below.

# Format

The MS Word template has predefined styles. It is strongly encouraged to use this template. If not, here are the basics:

* All font is size 9 pt Times New Roman (except author affiliations).
* Single spacing throughout.
* Only Level 1 headings (e.g., Introduction, Conclusions, References, etc.). No level 2 headings allowed.
* No line or page numbers. No headers or footers (other than footnotes). Do not include paper ID number.

# Specific Sections and Associated Built-In Style

* Title [Times New Roman 9 pt bold, style ‘Title’]. Left justified, sentence case, 6 pt space after.
* Authors [Times New Roman 9 pt regular, style ‘Authors’]. Left justified, 6 pt space after.
* *Affiliations [Times New Roman 8 pt italic, style ‘Affiliation’]. Left justified, capitalize as needed*
* Present address: Department, Institution/Organization, Place (e.g., City, State), Country (For any author whose present address differs from that at which the work was done) [Times New Roman 8 pt italic, style ‘Present Address’]: left justified, capitalize as needed
* Corresponding author [Times New Roman 9 pt regular, style ‘Authors’]. Left justified, 6 pt space after.
* ***Keywords: [Times New Roman 9 pt bold italics]*** Keyword a, Keyword b, Keyword c [Times New Roman 9 pt regular]. Left justified, alphabetical order, capitalize first word only of each keyword.
* ***Level 1 Heading [Times New Roman 9 pt bold italics, style ‘Heading 1’]. Left adjusted, bold, italics font, 6 pt space before***
* Body text. [Times New Roman 9 pt regular, style ‘Normal’]. Fully justified, 4 pt space after each paragraph of same style.
* **Table/Fig.[Times New Roman 9 pt bold]** Should be in-line, not embedded within the figure or table. The word “Table” and “Fig.” and number should be bold. Remainder of the caption should be normal font. Table caption above table, figure caption below figure[Times New Roman 9 pt regular, style ‘Normal’].
* References. Maximum of 8 references! [Times New Roman 9 pt regular, style ‘Normal’]. Left justified, NO hanging indent. Alphabetical order.

# Units of Measurement

* The International System of Units (SI) should be used. A list of units is found [here](https://www.nist.gov/pml/owm/metric-si/si-units). Recommendations for conversions and nomenclature appeared in Proceedings of the Nutrition Society (1972) 31, 239-247.
* Some frequently used units that are not in the SI system are accepted: e.g. l for litre, ha for hectare, eV for electron-volt, Ci for curie. Day, week, month and year are not abbreviated. The international unit for energy (energy value of feeds, etc.) is Joule (or kJ or MJ).
* A product of two units should be represented as N·m and a quotient as N/m (e.g. g/kg and not g.kg-1 or g kg-1).
* When there are two quotients, represent as: g/kg per day (not g/kg/day).

# Tables

* Tables shall not be wrapped within the text body. They should be orientated horizontally across the entire page. Use the No Spacing Style but be sure to remove space after paragraph.
* Captions should be presented in the text line directly below the figure.
* Keep tables as simple as possible and only include data referred to in the text
* Tables are recommended when exact numerical values are important. The same material should not be presented in both tabular and graphical form.
* Tables should be placed close to where they are referenced in the text.
* A table number and legend should be placed above each table.
* The number of vertical and horizontal lines in a table must be kept to a minimum. Generally, there should be no vertical lines within the body of a table.
* Values in a table should be in regular font.
* The number of decimals of P values for means and/or the error term should be homogenized or should follow a systematic rule.

# Figures

* Figure shall not be wrapped within the text body. They should wrapped TOP AND BOTTOM ONLY. Therefore, figures should be orientated horizontally to maximize space and word count.
* Captions should be presented in the text line directly below the figure.
* Figures are recommended to illustrate trends. The same material should not be presented in both tabular and graphical form.
* Figures should be embedded in the paper close to where they are referenced in the text.
* Figures should preferably be placed at the top or bottom of a page.
* All figures must have a figure number and a legend placed underneath the figure.
* All axes should have legends with units (where appropriate).
* All captions/legends on a figure must be clearly legible
* All maps must have a length scale.
* There should be no overall frame to a figure.
* Color is encouraged.

# Abbreviations

* Define non-standard abbreviations at first appearance followed by the abbreviation in brackets.
* Authors should avoid excessive use of non-standard abbreviations.
* No non-standard abbreviation in the (short) titles, in (sub)headings or in keywords.
* Non-standard abbreviations used in tables and figures must be defined either as footnotes or in the caption.
* Do not start a sentence with an abbreviation.

# Equations

* Preferable, equations should be written in Microsoft Equation Editor.
* Equations should normally be placed on separate lines from the text.
* Equations should be numbered sequentially, number appearing to the right of the equation and in round parentheses ().

# Presentation of statistical results

* Treatment means are reported with meaningful decimals. For guidance, the last digit of a treatment mean corresponds to 1x10 of standard error (e.g., for a standard error of 1.2, the mean values should be reported as 15).
* In the text, the probability of significance is indicated by the following conventional standard abbreviations (which need not be defined): P > 0.05 for non-significance and P < 0.05, P < 0.01 and P < 0.001 for significance at these levels. Exact level of probability (e.g. P = 0.07) can also be used.
* In tables, when data are analyzed by analysis of variance, a residual error term, is given for each criteria/item/variable/trait in a separate column.
* In tables, probabilities are indicated in a separate column. The P values (e.g. P = 0.07) are reported or indicated by \*, \*\* and \*\*\* for P < 0.05, P < 0.01 and P < 0.001, respectively.
* In tables, differences between treatments (or comparison of mean values) are indicated using superscript letters with the following conventional standard: a, b for P < 0.05; A, B for P < 0.01.

# Numerals

* In the text, use words for numbers zero to nine and numerals for higher numbers. In a series of two or
* more numbers, use numerals throughout irrespective of their magnitude.
* Do not begin sentences with numerals.
* For values less than unity, 0 is inserted before the decimal point.
* For large numbers in the text, substitute 10 n for part of a number (e.g. 1.6 10 6 for 1 600 000).
* Do not use a comma separator for numbers greater than 999 (e.g. 100 864).
* The multiplication sign between numbers should be a cross (x).
* Division of one number by another should be indicated as follows: 136/273.
* Use numerals if a number is followed by a standard unit of measurement (e.g. 100 g, 6 days, 4th week).
* Use numerals for dates, page numbers, class designations, fractions, expressions of time, e.g. 1 January
* 2007; type 2.
* Dates are given with the month written in full and the day in numerals (i.e. 12 January not 12th
* January).
* For time use 24-h clock, e.g. 0905 h, 1320 h.

# References

* Maximum of 8 total references!!!
* **Please double check all references are cited and that no extra references are in the reference list.**
* Literature quoted in the text should be indicated by author and publication year – one author (Smith, 2000); two authors (Smith & Jones, 2000); more than two authors (Smith et al., 2000).
* References should be listed in alphabetical order by authors' names.
* Only published works and those accepted for publication may be included. Submitted but not yet accepted papers may not be included.

Example extended abstract on the following page. Please do not use this as a template. Use the separate template document.

Development and application of an image acquisition system for characterizing sow behaviors in farrowing stall

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***Keywords:*** Animal welfare, Computer vision, Precision livestock farming, Swine

# Implications

A machine vision system for commercial farrowing barns was developed using Kinect V2® sensors and mini-PCs***.*** An image processing algorithm was used to create posture and behavior budgets for sows. Results of the processing algorithm were compared to those of trained human labelers to calculate accuracy, specificity, and sensitivity parameters. This system as a whole can be implemented in research settings to monitor multiple farrowing stalls simultaneously and economically. Posture and behavior budgets generated with this system provide insight into the effects of changes in the farrowing environment on sow behavior.

# Introduction

Farrowing environment is one of the most challenging aspects of commercial swine production. It is a dynamic phase for the sow, as she transitions from gestation to farrowing and lactation, along with the associated stressors and changing dietary needs. This stage of production is delicate for piglets as well, as they are most susceptible to crushing, chilling, and malnutrition soon after farrowing. Housing design and management is ideally aimed at accommodating the diverse needs of both piglets and sows, but due to the complex, interaction of animal and environment, compromises occur. Thermal needs, for example, are different for lactating sows and suckling piglets (MWPS-8, 1991), yet only one air temperature exists for their shared space. Many other production factors are changing as well, such as seasonal effects (King et al., 2018) and differences in breeding lines (Shurson and Irvin, 1992, Bloemhof et al., 2008). Mitigating these dynamic factors is nontrivial and such challenges contribute to an annual average U.S. pre-weaning mortality of 17.8% (Stalder, 2018), amounting to substantial economic loss.

The objectives of this research were: (1) implement a machine vision system with digital and depth images and data storage, (2) develop a process with minimal user input to classify sow posture (lying, sitting, standing, kneeling), lying orientation (right or left side of body), and behavior (feeding, drinking, other), and (3) verify classification algorithm accuracy, sensitivity, and specificity when compared to human labeling.

# Instrumentation and Image Processing

The data acquisition system was implemented at the United States Department of Agriculture - Agricultural Research Service U.S. Meat Animal Research Center in Clay Center, Nebraska. Typical commercial sow (Landrace × Yorkshire) husbandry practices were followed at the facility. This system was installed in a newly constructed farrowing building containing three environmentally controlled rooms, with each room comprising 20 farrowing stalls.

Above each farrowing stall, angle iron was attached perpendicularly to the truss for securing the waterproof (NEMA4 specification) plastic boxes (YH-121006, Polycase, Avon, OH, USA) containing the time-of-flight depth sensors (range 0.5 to 4.5 m) with integrated digital cameras (Kinect V2®, Microsoft, Redmond, WA, USA; Lachat et al., 2015). One mini-PC with Windows 10 Home Edition (Windows 10 Home, Microsoft, Redmond, WA, USA) was connected to one Kinect V2® sensor.

An algorithm was developed using MATLAB to analyze the depth images to classify sow posture and behavior. First, raw depth images were imported and pixels with a depth value outside the feasible sow height range were removed. Irrelevant areas (with respect to the sow), such as piglet creep areas, were trimmed from the image. Next, background objects with known locations and depths were removed (i.e., back gate of the sow stall and feeder trough). The average depth of pixels in each section was calculated and used to differentiate among postural positions.

# Accuracy Analysis

Four human labelers unaffiliated with the project were trained to evaluate the accuracy of the processing algorithm. Labelers were provided one example of each postural position and behavior prior to labeling a training set of depth images. An expert observer labeled a training set of 254 randomly selected images from one sow. Labelers independently labeled the training set and their results were compared with the expert labels. Each labeler was required to achieve at least 97% accuracy when compared with the expert posture labels, and a minimum of 90% accuracy for behavior labels. Labelers were retrained on images that were mislabeled in the training set before labeling images for the accuracy analysis.

# Example sow posture and behavior budgets.

Posture results were also summarized to monitor changes in daily posture budgets throughout the farrowing cycle (Fig. 1). Two sows compared in were both most active on the day of farrowing, as indicated by the number of posture shifts. The majority of each day was spent lying down, though the sows progressively spent less time in this posture as days in lactation increased. Daily posture budgets can be compared to investigate behavioral differences between animals and treatments. Such information could be useful for identifying compromised animals if their postural behavior deviates drastically. These results are similar to those reported in other studies of lactating sows (Johnson et al., 2001).

**Fig. 1.** Example of an hourly sow posture budget for a day. The sow was fed at approximately 06:30 h.

# Accuracy analysis

Posture classification accuracies by the processing program were 99.4% (sitting), 99.2% (standing), 99.7% (kneeling), and 99.9% (lying) compared to human labels. Overall posture identification reliability is not largely affected by the low specificity for this posture. Lying direction and behavior results are presented in Table 1. The processing algorithm classified the correct lying side of the sow with an accuracy of 96.2%. Inaccurate labels were often a result of the sow lying nearly sternal or piglets on the sow.

**Table 1.** Confusion matrix and accuracy parameters for lying direction and behavior labels.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Behavior | LLa | LRb | Feeding | Drinking | Other | Total | Specificityc (%) | Sensitivityc (%) | Accuracyc (%) |
| LLa | 4,516 | 218 | 0 | 0 | 0 | 4,734 | 97.0 | 95.4 | 96.2 |
| LRb | 141 | 4,440 | 0 | 0 | 0 | 4,581 | 95.3 | 96.9 | 96.2 |
| Feeding | 0 | 0 | 819 | 3 | 15 | 837 | 97.3 | 97.9 | 97.0 |
| Drinking | 0 | 0 | 9 | 103 | 21 | 133 | 88.3 | 77.4 | 96.8 |
| Other | 0 | 0 | 14 | 11 | 360 | 385 | 90.9 | 93.5 | 95.5 |
| Total | 4,657 | 4,658 | 842 | 117 | 396 | 10,670 | – | – | – |
| a Lying on left sideb Lying on right sidec Specificity, sensitivity, and accuracy were calculated for lying labels (LL, LR) separately from not lying labels (Feeding, Drinking, Other). |

# Acknowledgements

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