Model answer:

**Critical Appraisal – Denoising of PET images by context**

**modelling using local neighbourhood**

**correlation**

**General**

**Title: not descriptive enough, doesn’t explain some of the terms in the title or mention wavelets, spatially adapted wavelet shrinkage** mentioned in abstract not in title

**Authors**

*Strengths*

* *but they are from different institutions*
* *they are mostly experienced researches(written lots of papers between them)*
* *diversity of gender*

*Weaknesses*

* *The locations of each of the researchers is not very diverse, they are all from Madrid*
* *(maybe more research)*

**Abstract**

*Strengths*

* A fair summary of the methodology? Check after

*Weaknesses*

* Doesn’t go into enough detail about the results (by what factor how much better?)

**Introduction**

*Strengths*

* Has quite a lot of background research into other methods of noise reduction
* Makes a case for why it’s relevant and how it can impact the field

*Weaknesses*

* The SNR is not used as an acronym when it is used in the abstract, inconsistent
* Extensive section on “when considering noise in digital imaging” but it’s then made not relevant, should be flipped
* References are used in the middle of sentences making them confusing but they are not used in some areas that feel they need to be referenced “general denoising”
* Doesn’t explain what a wavelet is but uses the term frequently
* Uses the words “is able” indicating a conclusion within the introduction

**Materials and Methods**

*Strengths*

* *Extremely specific about how the data was collected*
* *Well-structured and broken down into sensible sub-headings*
* **Table 1:** Labels are very descriptive, data in the table has more relevance.

*Weaknesses*

* Does not explain how the photometric error was checked
* Does not explain how a lot of tests are checked
* Placement of the figure could be better
* *Only used one bed position for the phantom*
* *Says ROI was identical for each patient, this could be clearer*
* *Assumed, why?*
* *Lack of references in a couple of places*
* *In wavelet section there is a reference with no brackets(might go in references)*
* *Middle of sentence referencing (might go in references)*
* **Table 1:** Approximating the sphere to background ratio, would rather have exact values.

**Results**

*Strengths*

* **Figure 1:** Normalised data, in section (a): easier to see trends, scale is not overbearing.
* **Table 2:** Contains a lot of information displayed in a small space, displayed concisely and easy to read. Uses a selected variety of concentration.
* **Figure 2:** Contains all the data comparing the given algorithms. Graph fills the entire space, due to appropriate scaling optimises space between points.
* **Table 3:** Easy to read and understand, improves conceptual understanding of proposed method comparative RC values when compared to other filters.
* **Table 4:** Easy to read and understand improves conceptual understanding of proposed method SNR and contrast values when compared to other filters.
* **Figure 3:** All data is compressed into a single figure, tangible image gives a real-world representation of the effectiveness of the algorithm, also replicable because phantom widely available. All data is compressed into a single graph, trends can be extrapolated from the overall shape. Can see the similarities between the given algorithms.
* **Table 5:** Displays data in a format that is easy to read and understand, includes the actual value and variance in a single diagram, and relevant to the text.
* **Table 6:** Displays data in a format that is easy to read and understand, includes the actual value and variance in a single diagram, and relevant to the text.
* **Figure 4:** Differences between proposed and Gaussian filters are well demonstrated, and much easier to comprehend the differences between the two, the other graphs should have used this visualisation to display their data.
* **Figure 5:** Real world representation, actually a person, more than likely the primary use of the algorithm.
* **Figure 6:** The peaks of the two graphs is considerable noticeable, so you can tell that one is superior to the other.
* **Figure 7:** Very nice visualisation of segmentation, with the colours it’s very easy to determine what has been segmented.

*Weaknesses*

* Run tests to determine 5x5 matrix are the best, criteria for which is not specified, nor are the specifics of the test.
* Main limitation of denoising techniques come from the loss of resolution – No reference
* IEC Phantomn Series – Uses first person ‘our’ ‘we’ repeatedly henceforth.
* See Figure 4 at the top of the page, not at the top of that page, top of a different unrelated page.
* Figures and tables are always situated on the top of the page, and not necessarily, the page they are referenced on.
* The description of the table and the figures is not always within close proximity to the figure or table they reference.
* **Figure 1(a):** Contrast of figure is offset heavily to the left. Should have undertaken contrast equalisation. **(b):**no label of axis and angle of each graph makes them incomparable, and not representative of any data.
* **Table 2:** Compared against different intensities of Gaussian filter, but not compared against Poisson filters like the introduction suggested. The results imply an inconsistent methodology, if they were graphed there is no linear consistency.
* **Figure 2:**Why specifically used 39.0kBq ml-1, no rationale given. Difficult to visualise the data because zoomed in, the scale is taken out of context, and the points are too close together to comprehend. Another visual form should be used, for example a histogram.
* **Table 3:**Which filter is the standard Gaussian filter, specific not explained and rationale for the decision not explained. Proposed algorithm is in bold, and could be taken as an unethical bias, by drawing the eye to this date. 2 of the digits are not to 3 sigfig, inconsistent formatting.
* **Table 4:** Why only looking at 33mm Signal to noise ratio instance, should explain them all or explain why 37mm used.
* **Figure 3:**Rationale for random red lines on the noisy image not shown, noise assumed. Should show the difference between the result and the input. Variance is very small on the graph, so difficult to see the difference on all 3 lines, scale becomes obsolete when zoomed in. ‘Our method’ used as label, first person. Difference is represented as graph, but should be an image.
* **Table 5:**No weaknesses apparent.
* **Table 6:**The labels are not descriptive, ‘versus’ is not apparent as to what attribute we are comparing.
* **Figure 4:** Scale changes between the 2 graphs, so comparisons between the graphs becomes difficult, should be a difference between the 2 lines graph, or normalise the data. Top graph stops at roughly 30 samples, but text states 40 samples were used.
* **Figure 5:**Why is there a random Cyan line in the middle of the image? Should be referenced in the text and rationalised. Should be a figure that shows the difference between the input and noise removed for comparison. Used ‘Our method’ again, 1st person. Wrong kind of visualisation, should be a histogram, difficult to see differences in the data between algorithms. Difference is represented in a graph, but it should be an image. Image is tangible but graph is difficult to read.
* **Figure 6:** Same as above.
* **Figure 7:** Unnecessary unprofessional arrow added to figures, a lot of unnecessary image around the segment we are interested in, should’ve been cropped out. Should have another image showing the actual difference.

**Discussion**

*Strengths*

* A good recap of what has come before, refreshes the mind before discussing it further.
* Summarises results relatively well.
* Good sample size, including different kinds of samples.
* Good tie in to the end of an official body, gives legitimacy to the study.

*Weaknesses*

* ‘State of the art’ 1999: 1999 is not state of the art anymore.
* Consistent use of ‘we’ and ‘assumed’ first person usage and assuming is not scientific nor accurate.
* Beginning of discussion is redundant in places, due to repetition to prior comments in other sections.
* Irrelevant things mentioned: Things mentioned that aren’t in the paper, should be referenced or written about.
* Continuous changing of the reference style, inconsistent, brackets or lack thereof.
* 20% of the time that the programming is running is used up by the noise elimination routine, how was this measured to exactly 20%?

**Conclusion**

*Strengths:*

* No considerable advantages noticed. Doesn’t as such contribute to the paper.

*Weaknesses:*

* The word ‘good’ consistently used but not elaborated as to how ‘good’ is measured.
* No hypothesis for them to refute so can’t be refuted in the conclusion, no statistical analysis of their results either.
* No reasoning in the conclusion should be tied into the conclusion.

**Acknowledgments**

*Strengths*

* Less bias in the research, as it is not funded.

*Weaknesses*

* Funding section should be in acknowledgments at the beginning, possibly a factor as to why people may want to or not to read.

**References**

*Strengths*

* Got too late :P

*Weaknesses*

* Got too late :P
* Andy Hemming smells lol

**Overall**

Do on your own lazy fuck.