Dear Reviewer,

Thank you for the positive feedback and comments. In my responses below, equations' and references' numeration of the revised version is implied.

The work seems interesting from a theoretical point of view, but the author does not mention how one can observationally distinguish if a dark compact object (CDO) is a black hole or the proposed superfluid stellar configuration.

Well, that's exactly the point of the paper: considering the observational errors (both fundamental and technical), it's not possible to differentiate SF stars from BH's at a distance, i.e., without sending an ideal measuring apparatus through the horizon hypersurface (if it exists). All current observations advocate BH's based on indirect mass and size arguments, as mentioned in the paper, but SFs and BHs have approximately the same values of mass and size. Moreover, SF stars have an advantage: they seem to be more compatible with laws of quantum physics such as the Heisenberg uncertainty principle.

1. The quantisation argument followed in Eq. 2 leaves the metric tensor out of the quantisation scheme. Well, this is one of the key issues in developing a consistent quantisation procedure in curved spacetime in a fully relativistic way. And of course, unlike in non-relativistic quantum mechanics, spacetime is not just an idle measuring tool through which states evolve: it per se should part of the dynamic evolution of the quantum state.?

The quantization attempts of metric tensor in general relativity are known to be unsuccessful, because the resulting theory contains various divergences, ghosts and loop anomalies, and it is non-renormalizable in general. I could add this into manuscript but then I've realized that the presented arguments (pp 2-3) are quite universal - in a sense they do not depend on whether metric gets quantized or not. Therefore, it's better to use the Occam's razor and remove this discussion from the manuscript completely – to prevent readers' distraction and shorten the text.

2. It is not immediately clear why the scalar field describing the superfluid star should have the specific form of the potential given in Eq. 5

This type nonlinearity is borrowed from the models of the laboratory quantum liquids we know so far, as mentioned in the paragraph after Eq 6, the references have been given. It's quite natural to use something we already know is working.

Though not mentioned in the main body of the work, the author mentions in the abstract that the proposed superfluid star is singularity-free.

I did mention it in the text, using the synonym ‘nonsingular’, cf. page 5. Let me duplicate/emphasize this in the text once again.

I also noticed a couple of sentences (pp. 2, 6) with grammatical errors that make the reading difficult if left uncorrected.

My apologies for the broken English: I was submitting the 1st version under time constraints; therefore, I didn’t have time to send it to my editor. The revised version has had enough time to go through English proofreading.

Changes made

1. Various corrections in text (see my responses to Rev’s report)
2. References added
3. English proofread

Kind regards,

Author

This work proposes that a specific form of superfluid stellar configuration could be potential candidates of the end results of gravitational collapse of supermassive objects. These configurations, the author posits, can be viable black hole candidates or black hole mimickers. The work seems interesting from a theoretical point of view, but the author does not mention how one can observationally distinguish if a dark compact object (CDO) is a black hole or the proposed superfluid stellar configuration. The author mentions assumptions and approximations as one of the limitations of DCO modeling, and yet makes such assumptions and order-of-magnitude approximations in the current work's analysis. E.g:

1. The quantisation argument followed in Eq. 2 leaves the metric tensor out of the quantisation scheme. Well, this is one of the key issues in developing a consistent quantisation procedure in curved spacetime in a fully relativistic way. And of course, unlike in non-relativistic quantum mechanics, spacetime is not just an idle measuring tool through which states evolve: it per se should part of the dynamic evolution of the quantum state.

2. It is not immediately clear why the scalar field describing the superfluid star should have the specific form of the potential given in Eq. 5.

Though not mentioned in the main body of the work, the author mentions in the abstract that the proposed superfluid star is singularity-free. This, coupled with the absence of event horizons, would make an unusual candidacy for a black hole. I would like the author to provide comments on the above points. I also noticed a couple of sentences (pp. 2, 6) with grammatical errors that make the reading difficult if left uncorrected. Apart from the above concerns, I think the work is interesting enough to warrant publication in PoS.