# Article information:

Closed-form continuous-time neural networks | Nature Machine Intelligence  
<https://www.nature.com/articles/s42256-022-00556-7>

# Article summary:

1. Continuous-depth neural networks built by ordinary differential equations (ODEs) are effective in modeling data with complex dynamics, but their training and inference are slow due to the use of advanced numerical differential equation solvers.

2. The research community has developed solutions to address the computational overhead of ODE-based neural networks, such as state augmentation techniques, regularization schemes, and improving inference time.

3. The article proposes a closed-form continuous-depth model that does not require any solver to model data, providing faster training and inference speeds while maintaining the expressiveness of ODE-based models. The authors derive an approximate closed-form solution for a class of continuous neural networks that explicitly models time.

# Article rating:

Appears strongly imbalanced: The article is written in a biased or one-sided way, and the information it provides is not trustworthy enough to be considered a reliable source. You should consult other sources to find reliable information on the presented issues.

# Article analysis:

对于上述文章的详细批判性分析如下：

1. 偏见及其来源：文章存在一定的偏见，主要体现在对ODE-based neural networks的负面描述和对提出的closed-form continuous-depth model的过度赞扬上。作者将ODE-based neural networks描述为训练和推理速度慢，并且需要使用高级数值微分方程求解器，而没有提供足够的证据来支持这一观点。同时，作者过度强调了closed-form continuous-depth model的优势，但没有充分探讨其局限性和潜在问题。

2. 片面报道：文章只关注了continuous neural network architectures built by ODEs，并未提及其他类型的神经网络模型。这种片面报道可能导致读者对整个领域的认识不全面。

3. 无根据的主张：文章声称closed-form continuous-depth model具有与ODE-based models相同的表达能力，但并未提供充分的证据来支持这一主张。缺乏实验证据使得读者难以确定该模型是否真正具有相同水平的表达能力。

4. 缺失的考虑点：文章未涉及到closed-form continuous-depth model可能存在的风险和局限性。例如，该模型是否适用于所有类型的数据集？它是否能够处理复杂动态中存在的非线性关系？这些问题的缺失使得读者无法全面评估该模型的实用性和适用范围。

5. 所提出主张的缺失证据：文章声称closed-form continuous-depth model可以在挑战性的序列数据集上创建灵活、高效和快速的神经架构，但未提供充分的实验证据来支持这一主张。缺乏实验证据使得读者难以确定该模型是否真正具有所声称的优势。

6. 未探索的反驳：文章未对ODE-based neural networks进行充分的反驳。虽然作者提到了ODE-based models在相对较小的基准测试中表现出与先进离散化循环模型竞争力，但并未深入探讨其在更大规模和复杂任务中可能具有的优势。

7. 宣传内容：文章过度宣传了closed-form continuous-depth model，并未充分呈现其潜在局限性和风险。这种宣传性质可能导致读者对该模型过于乐观，而忽视了其他可能更合适或更有效的方法。

综上所述，上述文章存在偏见、片面报道、无根据的主张、缺失考虑点、所提出主张缺乏证据、未探索反驳以及宣传内容等问题。读者在阅读该文章时应保持批判的态度，并寻找更多相关研究和证据来全面评估所提出模型的优劣。

# Topics for further research:

* ODE-based neural networks的训练和推理速度慢
* ODE-based neural networks需要使用高级数值微分方程求解器
* closed-form continuous-depth model的优势
* closed-form continuous-depth model的局限性和潜在问题
* closed-form continuous-depth model与ODE-based models的表达能力比较
* closed-form continuous-depth model在挑战性的序列数据集上的性能

# Report location:

<https://www.fullpicture.app/item/f6e135585a73a518b6da5fcb1ef2f5a3>