# Periodic solutions to the relativistic Kepler problem: a variational approach

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## Talk Abstract

The motion of a relativistic particle in a Kepler potential can be described by the equation

$$\frac{\mathrm{d}}{\mathrm{d}t}\left(\frac{m\dot{x}}{\sqrt{1-|\dot{x}|^2/c^2}}\right) = -\alpha\,\frac{x}{|x|^3}, \quad x \in \mathbb{R}^2 \setminus \{0\},$$

where $m > 0$ is the mass of the particle, $c$ is the speed of light, and $\alpha > 0$ is a constant. Here, we deal with the forced equation

$$\frac{\mathrm{d}}{\mathrm{d}t}\left(\frac{m\dot{x}}{\sqrt{1-|\dot{x}|^2/c^2}}\right) = -\alpha\,\frac{x}{|x|^3} + \nabla_x U(t,x), \quad x \in \mathbb{R}^2 \setminus \{0\},$$

where $U(t,x)$ is $T$-periodic in the first variable, and we show how to apply non-smooth critical point theory to prove the existence of multiple $T$-periodic solutions, with prescribed winding number around the origin. Joint work [**?**] with Walter Dambrosio and Duccio Papini.

**Keywords:** relativistic Kepler problem, periodic solutions, non-smooth critical point theory.

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## References

[1] Boscaggin, A., Dambrosio, W. and Papini, D., Periodic solutions to relativistic Kepler problems: a variational approach, preprint, 2022.