

ESR 5 report

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Project: 4D ambitwistor theory for $N = 8$ supergravity

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SAGEX

Scattering Amplitudes:
from Geometry to Experiment



Previous background

- Born and raised in [Perugia, Italy](#), where I lived for 23 years
- **Bachelor's studies in Physics** in the [University of Perugia](#), graduated cum laude in 2016
- **Master's degree in Physics** in the same University, obtained cum laude in 2018
- Two months spent at the [Niels Bohr Institute](#) in [Copenhagen](#) to work on my Master's thesis
- January 2019: employed through **SAGEX** at DESY Hamburg

8 November 2019

SAGEX Review Meeting: ESR 5 report



4D Ambitwistor Theory for N=8 Supergravity



One of the biggest challenges in theoretical physics: **Quantum Gravity!**

- **N=8 Supergravity** is the only known gravitational Quantum Field Theory that might be perturbatively quantizable
- **Ambitwistor strings** approaches may make this more manageable
- Some results are already established in first approximation (tree-level), but do not work beyond this (loop-level)
- We are taking inspiration from other modern topics (**Massive Spinor Helicity, Pure Spinor Superstrings**) to build an extended model

Training received



- Schools and workshops:
 - YRISW 2019: A modern primer for 2D CFT
 - Hamilton School on Mathematical Physics
 - Amplitudes 2019
 - DESY Theory Workshop 2019: Quantum Field Theory meets Gravity
 - 1st SAGEX training school
- Soft skills trainings through SAGEX
- German classes in DESY
- Improvisation theatre for scientists

Interactions with SAGEX members



- The group of ESRs is very cohesive, and I feel I am an integral part of it
- No obstacles in communication with senior network members. The SAGEX events helped in this direction
- Already had multiple interactions with my mentor. These always led to fruitful ideas and discussions



Secondment

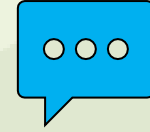


- Secondment in Wolfram Research: 14 September – 14 December 2020
- Project: implement a class of special functions in Mathematica and improve the function `Integrate` to recognize and manipulate them
- Possibility to do local outreach activities



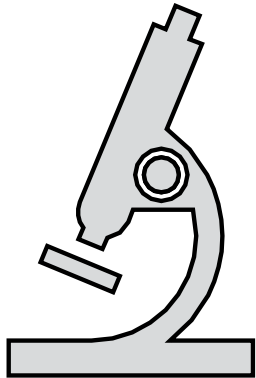
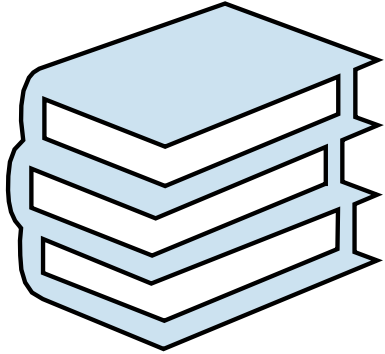
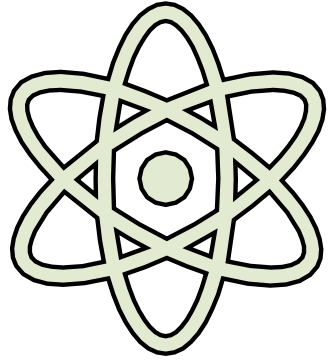
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Outreach



- Contributions to the SAGEX video project and SAGEX exhibition
- Contributions to the management of the [@SAGEXNetwork](https://twitter.com/SAGEXNetwork) twitter account.
- Organizational assistance in local events (1st SAGEX school, DESY Theory Workshop)
- Planning to help with local activities
 - DESY Open Day (20 June 2020)
 - Wissen vom Fass (April 2020?)

Future plans



- Through SAGEX, I would like to **make science the central element of my life**
- I am still too early in my PhD to be sure on which path suits me best
- I really enjoy what I am doing, so my current focus is on **pursuing an academic career**
- Secondment in Wolfram Research can be in any case an added value:
 - Mathematica is important for research in theoretical physics
 - This experience will help me understand how is work life outside academia
- I am very excited to see what awaits me!