# Gurpinder Singh Sidhu

PhD student | John Innes Centre, Norwich, UK
Webpage: gurpinder98.github.io | LinkedIn: Gurpinder Singh | Github: gurpinder98

## Research Experience

**Postgraduate Researcher, John Innes Centre** Oct. 2021 - Present
PhD project: Genetic regulation of flowering time in *Brassica napus*
Supervisors: Prof. Richard J Morris, Dr. Rachel Wells, Dr. Wilfried Haerty
- Using time-series RNAseq data and a random forest based network inference method, elucidated first flowering time regulatory networks in *Brassica napus*.
- Using promoter motif analysis and lab experiments, validated the divergence in regulation of copies of a key flowering time gene, *SOC1*.
- Using TensorFlow, implemented a Gaussian process based network inference algorithm, see github: gurpinder98/Gaussian_network_inference
- Wrote a reciprocal BLAST search program for mapping genes across assemblies and related species, see github: gurpinder98/boss

Project: A Bayesian framework for differential expression Collaborators: Dr. Franziska Hoerbst, Dr. Melissa Tomkins
- Contributed substantially to the development, testing and publication of a novel differential gene expression method.
- Wrote Python scripts for generating simulated RNAseq datasets and R scripts for testing using existing bioconductor packages, edgeR and DESeq2. For code, see github: Morris-Research-Group/bayexpress

**Bioinformatician, John Innes Centre** Jul. 2021 - Sep. 2021
Project: Haplotype analysis for *Brassica napus* cultivars Supervisor: Prof. Steve Penfield
- Worked on processing of large scale Eco-TILLING sequencing data for *Brassica napus* populations.
- Used freebayes for variant calling and wrote code for hierarchical clustering of cultivars based on haplotypes. For code, see github: gurpinder98/hapcaller
- Was able to get familar with the dataset, analyse data and produce results presented at a conference within 2 months.

**Undergraduate Research Trainee, Punjab Agricultural University** Sep. 2020 - Jun. 2021
Final year project: Identification and characterisation of allergen proteins in rice Supervisor: Dr. Deepak Singla
- Used HMMER for in-silico identification of putative allergen proteins expressed in *Oryza sativa* pollen based on known allergen protein domains. For scripts, see github: gurpinder98/Allergen_project_scripts
- Used existing machine learning tools for allergen classification and IgE epitope prediction.

Project: Estimation of protein content in QPM Maize seeds through image analysis. Collaborator: Dr. Alla Singh
- Collaborated with researchers at Indian Institute of Maize Research (IIMR) and wrote a GUI program, using Flask, to estimate the protein content in QPM maize seeds using image segmentation.

**Undergraduate summer school student, John Innes Centre** Jun. 2020 - Jul. 2020
Project: Investigation of population structure and RNA-Seq analysis.
- Used an RNA-Seq analysis pipeline to map *Brassica oleracea* reads and used STRUCTURE for identification of population structure within a dataset of 84 *Brassica napus* accessions.

## Other Experience

**Graphic designer and web developer**, Iceland Ocean Cluster, Reykjavík Mar. 2023 - May 2023
- Created websites, print materials and branding guidelines for Iceland Eco-Business Park and Iceland Ocean Cluster.

## Education

**PhD (Computational Biology)**, John Innes Centre, Norwich, UK Oct. 2021 - present
Thesis: Genetic regulation of flowering time in *Brassica napus*
Supervisors: Prof. Richard J Morris, Dr. Rachel Wells, Dr. Wilfried Haerty

**B.Tech (Biotechnology)**, Punjab Agricultural University, Ludhiana, India Jun. 2017 - Jun. 2021
First Class, with Merit. CGPA: 8.31/10.00

## Technical Skills

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| Programming | Python (Advanced), R (Advanced), Bash (Intermediate), C (Intermediate), Rust (Beginner) |
| Computational skills | Machine Learning (TensorFlow, GPflow, Keras), Web (Flask, BeautifulSoup)<br>large scale data analysis, HPC (slurm), Workflow managers (snakemake), LaTeX and Git |
| Bioinformatics skills | RNAseq analysis, Functional genomics, Differential gene expression, Network analysis,<br>Sequence analysis, Variant calling, Haplotype analysis, AlphaFold |
| Lab skills | Plant biology (tissue sampling), Molecular Biology (RNA isolation),<br>microscopy (tissue dissections), data collection |

## Selected publications

Hoerbst F, **Sidhu GS**, Tomkins M, Morris RJ. What is a differentially expressed gene? bioRxiv. 2025.
doi: 10.1101/2025.01.31.635902
Hoerbst F, **Sidhu GS**, Omori T, Tomkins M, Morris RJ. A Bayesian framework for ranking genes based on their statistical evidence for differential expression. bioRxiv. 2025.
doi: 10.1101/2025.01.20.633909

**In preparation:**
**Sidhu GS**, Woolfenden H,Wells R, Morris RJ. Divergence of flowering time gene regulatory networks in *Brassica napus*.
Kristianingsih R, Calderwood A, **Sidhu GS**, Woodhouse S, Woolfenden H, Kurup S, Wells R, Morris RJ. Identifying dynamical similarities between sets of gene expression profiles using curve registration.

For the full list of publications, please see Google Scholar

## Awards (since 2021)

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| 2025 | Winner of YES 24, Your Entrepreneurs Scheme (YES) | £2,500 |
| | Winner of YES 24 (People's Choice), Indigo Business | |
| | Best sustainable agriculture business plan, Syngenta | £500 |
| | Best executive summary, Reacta Healthcare | £500 |
| 2024 | Genius of the month (July 2024), John Innes Centre | |
| 2021 | Merit Certificate for outstanding performance in B.Tech (Biotechnology) | |

## Conferences (Oral presentations)

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| 2025 | UK Brassica Research Conference, Rothamsted Research, UK *scheduled* |
| 2024 | 34th International Conference on Arabidopsis Research, San Diego, USA |
| | 3rd Early Career Research Conference, Max Planck Institute for Plant Breeding Research, Germany |
| 2023 | 16th International Rapeseed Congress, Sydney, Australia |
| 2022 | UK Brassica Research Conference, John Innes Centre, UK |

## Outreach and volunteering

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| 2025 | Norwich Science Festival, speaker, Norwich Research Park Enterprise event. |
| 2024 | ECR Conference at MPIPZ cologne, Germany, volunteer organiser. |
| 2023-2025 | Webmaster, John Innes Centre Student Voice committee. |
| 2022-2025 | UEA STEMM Detectives, wrote and delivered an engineering workshop for students. |
| 2023-2025 | UEA/JIC Find my Future, Volunteer as a part of 'Meet a STEMM Professional' session. |
| 2023-2024 | UEA BIO Outreach, Lab demonstrator for a DNA fingerprinting workshop. |
| 2022 | UEA Make it Count, Mathematics tutor for Yr 10 students from disadvantaged backgrounds. |