

# Raunak Shrestha

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## RESEARCH STATEMENT

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I like to understand the biological problems behind a complex disease, interpret the problem in a mathematical language and provide a computational solution to the problem. My main interest lies in the development of computational algorithms and its applications on big biological data to enable precision oncology.

Recent advances in high throughput technologies have enabled us to assess multi-dimensional view of a complex diseases process. I believe, to integrate these “big data”, the computational model must be complex enough to be accurate while being simple enough to portray the underlying biology. For this, network approaches helps to bring these multi-dimensional data into a single-analysis framework.

My current research focuses on exploring this idea to prioritize cancer driver genes and predict genotype-phenotype relationships in cancer. Most recently, I’ve been focusing on developing computational tools to predict targeted cancer therapeutics based on patient’s genetic information. My other research interests lies in cancer biomarker discovery, systems medicine and data science.

## POST-SECONDARY EDUCATION

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| SEPT 2012 - AUG 2018 | Doctor of Philosophy in BIOINFORMATICS, <b>University of British Columbia</b> , Canada<br>under Bioinformatics Training Program for Health Research<br>Supervisors: Dr. Colin C. Collins and Dr. S. Cenk Sahinalp<br>Thesis Title: “Computational Prioritization of Cancer Driver Genes for Precision Oncology” |
| SEPT 2011 - AUG 2012 | Master of Science in BIOINFORMATICS, <b>Simon Fraser University</b> , Canada<br>under Bioinformatics Training Program for Health Research<br>(Transferred to PhD program)   |
| 2005 - 2009          | Bachelors of Technology (B.Tech.) in BIOTECHNOLOGY, <b>Kathmandu University</b> , Nepal   |

## RESEARCH & TRAINING EXPERIENCE

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| SEPT 2012 - AUG 2018  | PhD Candidate, Laboratory for Advanced Genome Analysis,<br><b>Vancouver Prostate Centre</b> , Vancouver, BC, Canada             |
| MAY - AUG 2012        | Graduate Research Student, Laboratory for Advanced Genome Analysis,<br><b>Vancouver Prostate Centre</b> , Vancouver, BC, Canada |
| SEPT 2011 - MAY 2012  | Graduate Research Student,<br><b>Simon Fraser University</b> , Burnaby, BC, Canada  |
| JULY 2009 - JULY 2011 | Research Associate, <b>Center for Molecular Dynamics Nepal</b> , Kathmandu, Nepal   |
| JAN - JUNE 2009       | Undergrad Research Student, <b>Genetics Nepal</b> , Kathmandu, Nepal  |

## SELECTED PUBLICATIONS

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- Shrestha R, Nabavi N, Lin Y, Mo F, Anderson S, Volik S, Adomat HH, Lin D, Xue H, Dong X, Shukin R, Bell RH, McConeghy B, Haegert A, Brahmbhatt S, Li E, Oo HZ, Hurtado-Coll A, Fazli L, Zhou J, McConnell Y, McCart A, Lowy A, Morin GB, Daugaard M, Sahinalp SC, Hach F, LeBihan S, Gleave ME, Wang Y, Churg A, and CC Collins. (2018) **Integrated Multi-omics Molecular Subtyping Predicts Therapeutic Vulnerability in Malignant Peritoneal Mesothelioma.** (*In submission*) ([Preprint doi:10.1101/24347](https://doi.org/10.1101/24347)).
- Hodzic E, Shrestha R<sup>†</sup>, Zhu K, Cheng K, Collins CC, and SC Sahinalp. (2018) **Combinatorial Detection of Conserved Alteration Patterns for Identifying Cancer Subnetworks.** (*In submission*) <sup>†</sup>As joint first author
- Shrestha R, Hodzic E, Sauerwald T, Dao P, Yeung J, Wang K, Anderson S, Haffari G, Collins CC, and Sahinalp SC. (2017) **HIT'nDRIVE: Patient-Specific Multi-Driver Gene Prioritization for Precision Oncology.** *Genome Research*. 27:1573-1588. doi:10.1101/gr.221218.117. PMID:28768687
- Shrestha R, Hodzic E, Yeung J, Wang K, Sauerwald T, Dao P, Anderson S, Beltran H, Rubin M., Collins C, Haffari G and SC Sahinalp. (2014) **HIT'nDRIVE: Multi-Driver Gene Prioritization based on Hitting Time.** In Sharan R, editor; *Research in Computational Molecular Biology: 18th Annual International Conference, RECOMB 2014, Pittsburgh, PA, USA, April 2-5, 2014, Proceedings, pages 293–306.* Springer International Publishing.

## RELEVANT PUBLICATIONS

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- Feng Y, Ren S, Shrestha R, Bell R, Volik S, Cox M, Sharifi-Noghabi H, Zhou J, Jun W, Li Y, Jian W, Wang Y, Sun Y, and CC Collins. (2018) **Metagenomic and metatranscriptomic analysis of human prostate microbiota from patients with prostate cancer.** (*in submission*)
- Sharifi-Noghabi H, Liu Y, Erho N, Shrestha R, Alshalalfa M, Davicioni E, Collins CC, and M Ester. (2018) **Deep Genomic Signature for early metastasis prediction in Prostate Cancer.** (*in submission*) ([Preprint: doi:10.1101/276055](https://doi.org/10.1101/276055))
- Gill E, Chan L, Winsor G, Dobson N, Lo R, Sui SH, Dhillon B, Taylor P, Shrestha R, Spencer C, Hancock R, Unrau P, and Brinkman F. (2018) **High-throughput detection of RNA processing in bacteria.** *BMC Genomics*. 19:223. PMID:29587634
- Yamada M, Tang J, Lugo-Martinez J, Hodzic E, Shrestha R, Saha A, Ouyang H, Yin D, Mamitsuka H, Sahinalp C, Radivojac P, Menczer F, and Chang Y. (2018) **Ultra High-Dimensional Nonlinear Feature Selection for Big Biological Data..** *IEEE Transactions on Knowledge and Data Engineering*. 99. doi:10.1109/TKDE.2018.2789451
- Luk I, Shrestha R, Xue H, Wang Y, Zhang F, Lin D, Haegert A, Wu R, Dong X, Collins CC, Zoubeydi A, Gleave ME, Gout PW, and Wang Y. (2016) **BIRC6-targeting as potential therapy for advanced, enzalutamide-resistant prostate cancer.** *Clin Cancer Res*. 2016 Sep 23. PMID:27663589
- Wyatt A, Mo F, Wang K, McConeghy B, Brahmbhatt S, Jong L, Mitchell D, Johnston R, Haegert A, Li E, Liew J, Yeung J, Shrestha R, Lapuk A, McPherson A, Shukin R, Bell R, Anderson S, Bishop J, Hurtado-Coll A, Xiao H, Chinnaiyan A, Mehra R, Lin D, Wang Y, Fazli L, Gleave M, Volik S, and Collins CC. (2014) **Heterogeneity in the inter-tumor transcriptome of high risk prostate cancer.** *Genome Biol*. 15(8):426. PMID:25155515
- Wang K, Shrestha R, Wyatt AW, Reddy A, Lehar J, Wang Y, Lapuk A and CC Collins. (2014) **A Meta-Analysis Approach for Characterizing Pan-Cancer Mechanisms of Drug Sensitivity in Cell Lines.** *PLoS ONE* 9(7). PMID:25036042
- Shrestha R, Joshi R., Joshi K, Poudel BH and BG Shrestha. (2011) **Analysis of KatG Ser315Thr Mutation in Multidrug Resistant Mycobacterium tuberculosis and SLC11A1 Polymorphism in Multidrug Resistance Tuberculosis in Central Development Region of Nepal Using PCR-RFLP Technique: A Pilot Study.** *Nepal Journal of Biotechnology* 1 (1), 14-21.

## CONFERENCE PRESENTATIONS

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### Selected Oral Presentations

- BAP1 Loss Predicts Therapeutic Vulnerability in Malignant Peritoneal Mesothelioma. 14<sup>th</sup> International Conference of the International Mesothelioma Interest Group (iMig2018) May 2-5, 2018, Ottawa, Canada
- HIT'nDRIVE: Patient-Specific Multi-Driver Gene Prioritization for Precision Oncology. 8<sup>th</sup> Annual Scientific Meeting, Terry Fox Research Institute. November 4, 2017, Vancouver, Canada
- Translating Big-Data to Precision Oncology. Vancouver Prostate Centre / Terry Fox Seminar, February 17, 2017, Vancouver General Hospital, Vancouver, Canada.
- HIT'nDRIVE: Patient-Specific Multi-Driver Gene Prioritization for Precision Oncology. Vancouver Bioinformatics User Group (VanBUG) November 3, 2016, Vancouver, Canada
- HIT'nDRIVE: Patient-Specific Multi-Driver Gene Prioritization for Precision Oncology. 10<sup>th</sup> Annual Lorne D. Sullivan Lectureship & Research Day. June 21, 2016, Vancouver General Hospital, Vancouver, Canada.
- HIT'nDRIVE: Patient-Specific Multi-Driver Gene Prioritization to Guide Precision Cancer Medicine. Workshop on Network Biology (Algorithmic Challenges in Genomics). April 11-15, 2016, Simons Institute for the Theory of Computing, UC Berkeley, Berkeley, CA, USA. <https://simons.berkeley.edu/talks/raunak-shrestha-04-12-16>
- Computational Detection and Prioritization of Driver Alterations in Cancer. Vancouver Prostate Centre / Terry Fox Seminar, November 3, 2014, Vancouver General Hospital, Vancouver, Canada.
- HIT'nDRIVE: Multi-Driver Gene Prioritization based on Hitting Time. 18th Annual International Conference on Research in Computational Molecular Biology (RECOMB). April 2-5, 2014, Pittsburgh, PA, USA.
- Analysis of KatG Ser315Thr Mutation in Multidrug Resistant Mycobacterium tuberculosis and SLC11A1 Polymorphism in Multidrug Resistance Tuberculosis in Central Development Region of Nepal Using PCR-RFLP Technique: A Pilot Study. 2nd International Symposium on Biotechnology, June 29-30, 2010, Kathmandu, Nepal

### Selected Poster Presentations

- **Raunak Shrestha**, Ermin Hodzic, Thomas Sauerwald, Phuong Dao, Kendric Wang, Jake Yeung, Shawn Anderson, Fabio Vandin, Gholamreza Haffari, Colin C. Collins and S. Cenk Sahinalp.(2017). HIT'nDRIVE: Patient-Specific Multi-Driver Gene Prioritization for Precision Oncology. 4th Canadian Cancer Research Conference, November 4-7, 2017, Vancouver, BC, Canada.
- **Raunak Shrestha**, Ermin Hodzic, Thomas Sauerwald, Phuong Dao, Kendric Wang, Jake Yeung, Shawn Anderson, Fabio Vandin, Gholamreza Haffari, Colin C. Collins and S. Cenk Sahinalp.(2017). HIT'nDRIVE: Patient-Specific Multi-Driver Gene Prioritization for Precision Oncology. Genome Informatics, November 1-4, 2017, Cold Spring Harbor Laboratory, NY, USA.
- **Raunak Shrestha**, Ermin Hodzic, Thomas Sauerwald, Phuong Dao, Kendric Wang, Jake Yeung, Shawn Anderson, Fabio Vandin, Gholamreza Haffari, Colin C. Collins and S. Cenk Sahinalp.(2016). HIT'nDRIVE: Patient-Specific Multi-Driver Gene Prioritization for Precision Oncology. The 27<sup>th</sup> International Conference on Genome Informatics, October 3-5, 2016, Fudan University, Shanghai, China.
- Noushin Nabavi, **Raunak Shrestha**, Yuzhuo Wang and Colin C. Collins (2016). Characterization of intertumor heterogeneity in Malignant Mesothelioma. 13<sup>th</sup> International Conference of the International Mesothelioma

Interest Group (iMIG 2016), May 1-4, 2016, Birmingham, UK. (As a first co-author).

- **Raunak Shrestha**, Ermin Hodzic, Fan Mo, Anna Lapuk, S. Cenk Sahinalp and Colin C. Collins (2015). Computational Detection and Prioritization of Driver Alterations in Prostate Cancer from Multi-Omics Data. Eighth Annual Prostate Cancer Program Retreat (SPORE), March 15-17, 2015, Fort Lauderdale, Florida, USA. **(Selected among the top-eight poster of the conference.)**
- **Raunak Shrestha**, Kendric Wang, S. Cenk Sahinalp, Anna Lapuk and Colin Collins (2013). Exploring the Biology of Prostate Cancer Progression using Systems Biology Approach. The Eleventh Asia Pacific Bioinformatics Conference, January 21-23, 2013, Vancouver, Canada.

## AWARDS AND HONORS

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| 2018      | UBC Translational Cancer Genomics Travel Award (iMig2018).                              |
| 2016-2018 | Mitacs Accelerate PhD Fellowship.   |
| 2015-2016 | Prostate Cancer Foundation - British Columbia (PCF-BC) Research Awards - 2015.          |
| 2014-2016 | Faculty of Science Graduate Award, University of British Columbia.                      |
| 2014      | International Society for Computational Biology (ISCB) Travel Fellowship (RECOMB-2014). |
| 2011-2013 | CIHR Bioinformatics Training Program for Health Research.                               |

## PROGRAMMING LANGUAGE SKILLS

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- R, perl (Expert)
- C, C++, python, php, sql (proficient)

## ACADEMIC PAPERS PEER REVIEWED

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(number of reviews parenthesized)

Nature Communications	(3)
BMC Genomics	(1)
BMC Bioinformatics	(1)
Bioinformatics	(2)
Research in Computational Molecular Biology (RECOMB)	(3)
International Conference on Intelligent Systems for Molecular Biology (ISMB)	(1)
The Asia Pacific Bioinformatics Conference (APBC)	(1)
Workshop on Algorithms in Bioinformatics (WABI)	(1)
Nepal Journal of Biotechnology	(7)