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PROJECTS: deFuse, deStruct, ReMixT,
citup, dollo, pypeliner

RESEARCH INTERESTS

Cancer genomics, computational biology, phylogenomics, genome rearrangements, combinatorial algorithms, graph theory, probabilistic methods.

EDUCATION

OCT 2015 **School of Computing Science, Simon Fraser University**
Ph.D. in Computing Science
Thesis: Characterization of Genome Rearrangements from Tumour Sequencing Data
Supervisors: S. Cenk Sahinalp and Sohrab P. Shah

AUG 2002 **School of Engineering Science, Simon Fraser University**
B.A.Sc. in Engineering Science

RESEARCH EXPERIENCE

OCT 2015 - **Post-doctoral Fellow, Shah Lab for Computational Cancer Biology**
Lead a team of software engineers developing cloud based infrastructure for a project to sequence and analyze single cell genomes. Continuation of PhD work on tumour evolution in ovarian and breast cancer.

MAY 2009 - OCT 2015 **Research Assistant, Shah Lab for Computational Cancer Biology**
Cancer genomics, high-throughput sequence analysis and computational method development. Lead researcher for a study of tumor evolution in High Grade Serous Ovarian Cancer.

JAN - APR 2009 **Research Assistant, SFU Brinkman Lab with Fiona Brinkman**
Proteomics analysis and pipeline development for novel drug discovery.

SEP - DEC 2008 **BC Genome Science Centre with Marco Marra**
Analysis of microRNA sequencing from tumour samples.

MAY - AUG 2008 **SFU Mathematics Department with Cedric Chauve**
Implemented combinatorial algorithms for comparative genomics.

TEACHING EXPERIENCE

MAY 2014 - **Bioinformatics for Cancer Genomics Workshop, Toronto Canada**
Developed and teach the workshops Gene Fusion module, a 3 hour seminar and lab.

WORK EXPERIENCE

- APR 2005 - SEP 2007 **Software Engineer, Electronic Arts, Vancouver Canada**
Lead PlayStation 2 Programmer for Need for Speed, one of EA's top selling franchises.
- OCT 2002 - NOV 2004 **Software Engineer, Argonaut Software Ltd, London UK**
Development of bespoke tools for game artists.

FUNDING AND AWARDS

- 2017 **Michael Smith Trainee Fellowship**
- 2015 Travel & Minor Research Award
- 2013 Travel & Minor Research Award
Graduate Prize in CMPT
DBMiner Graduate Scholarship in CMPT
Helmut and Hugo Eppich Family Graduate Scholarship
- 2012 **Alexander Graham Bell Canada Graduate Scholarship**
Graduate Fellowship
External Graduate Award
The ABC Recycling Ltd. Graduate Scholarship
The Clark Wilson Graduate Scholarship
- 2011 Michael & Grace Kreykenbohm Graduate Scholarship
Graduate Fellowship
- 2010 Faculty of Applied Sciences Graduate Fellowship
Hugo Eppich Graduate Scholarship
- 2008 **CIHR Bioinformatics Training Program Scholarship**
NSERC Undergraduate Student Research Award

PUBLICATIONS

- 2018 **Resource: Scalable whole genome sequencing of 40,000 single cells identifies stochastic aneuploidies, genome replication states and clonal repertoires**
Laks E, Zahn H, Lai D, *McPherson A*, Steif A, Brimhall J, Biele J, Wang B, Masud T, Grewal D, Nielsen C, Leung S, Bojilova V, Smith M, Golovko O, Poon S, Eirew P, Kabeer F, Ruiz de Algora T, Lee SR, Taghiyar MJ, Huebner C, Ngo J, Chan T, Vatr-Watts S, Walters P, Abrar N, Chan S, Wiens M, Martin L, Scott RW, Underhill MT, Chavez E, Steidl C, Da Costa D, Ma Y, Coope RJN, Corbett R, Pleasance S, Moore R, Mungall AJ, Marra MA, Hansen C, Shah S, Aparicio S
► bioRxiv, Sep 2018

Interfaces of Malignant and Immunologic Clonal Dynamics in Ovarian Cancer.

Zhang AW, *McPherson A*, Milne K, Kroeger DR, Hamilton PT, Miranda A, Funnell T, Little N, de Souza CPE, Laan S, LeDoux S, Cochrane DR, Lim JLP, Yang W, Roth A, Smith MA, Ho J, Tse K, Zeng T, Shlafman I, Mayo MR, Moore R, Failmezger H, Heindl A, Wang YK, Bashashati A, Grewal DS, Brown SD, Lai D, Wan ANC, Nielsen CB, Huebner C, Tessier-Cloutier B, Anglesio MS, Bouchard-Côté A, Yuan Y, Wasserman WW, Gilks CB, Karnezis AN, Aparicio S, McAlpine JN, Huntsman DG, Holt RA, Nelson BH, Shah SP

► Cell, Jun 2018

Computational identification of micro-structural variations and their proteogenomic consequences in cancer.

Lin Y, Gawronski A, Hach F, Li S, Numanagic I, Sarrafi I, Mishra S, *McPherson A*, Collins CC, Radovich M, Tang H, Sahinalp SC

► Bioinformatics (Oxford, England), May 2018

2017 **ReMixT: clone-specific genomic structure estimation in cancer**

McPherson AW, Roth A, Ha G, Chauve C, Steif A, de Souza CPE, Eirew P, Bouchard-Côté A, Aparicio S, Sahinalp SC, Shah SP

► Genome Biol, Jul 2017

Genomic consequences of aberrant DNA repair mechanisms stratify ovarian cancer histotypes

Wang YK, Bashashati A, Anglesio MS, Cochrane DR, Grewal DS, Ha G, *McPherson A*, Horlings HM, Senz J, Prentice LM, Karnezis AN, Lai D, Aniba MR, Zhang AW, Shumansky K, Siu C, Wan A, McConechy MK, Li-Chang H, Tone A, Provencher D, de Ladurantaye M, Fleury H, Okamoto A, Yanagida S, Yanaihara N, Saito M, Mungall AJ, Moore R, Marra MA, Gilks CB, Mes-Masson A, McAlpine JN, Aparicio S, Huntsman DG, Shah SP

► Nat Genet, Jun 2017

Observing Clonal Dynamics Across Spatiotemporal Axes: A Prelude to Quantitative Fitness Models for Cancer

McPherson AW, Chan FC, Shah SP

► Cold Spring Harb Perspect Med, Jun 2017

E-scape: interactive visualization of single-cell phylogenetics and cancer evolution

Smith MA, Nielsen CB, Chan FC, *McPherson A*, Roth A, Farahani H, Machev D, Steif A, Shah SP

► Nat Methods, May 2017

deStruct: Accurate Rearrangement Detection using Breakpoint Specific Realignment

McPherson A, Shah SP, Sahinalp SC

► bioRxiv, Mar 2017

2016 **Histological Transformation and Progression in Follicular Lymphoma: A Clonal Evolution Study**

Kridel R, Chan FC, Mottok A, Boyle M, Farinha P, Tan K, Meissner B, Bashashati A, *McPherson A*, Roth A, Shumansky K, Yap D, Ben-Neriah S, Rosner J, Smith MA, Nielsen C, Giné E, Telenius A, Ennishi D, Mungall A, Moore R, Morin RD, Johnson NA, Sehn LH, Tousseyn T, Dogan A, Connors JM, Scott DW, Steidl C, Marra MA, Gascoyne RD, Shah SP

► PLoS Med, Dec 2016

Clonal genotype and population structure inference from single-cell tumor sequencing

Roth A, *McPherson A*, Laks E, Biele J, Yap D, Wan A, Smith MA, Nielsen CB, McAlpine JN, Aparicio S, Bouchard-Côté A, Shah SP

► Nat Methods, Jul 2016

Divergent modes of clonal spread and intraperitoneal mixing in high-grade serous ovarian cancer

McPherson A, Roth A, Laks E, Masud T, Bashashati A, Zhang AW, Ha G, Biele J, Yap D, Wan A, Prentice LM, Khattra J, Smith MA, Nielsen CB, Mullaly SC, Kalloger S, Karnezis A, Shumansky K, Siu C, Rosner J, Chan HL, Ho J, Melnyk N, Senz J, Yang W, Moore R, Mungall AJ, Marra MA, Bouchard-Côté A, Gilks CB, Huntsman DG, McAlpine JN, Aparicio S, Shah SP

► Nat Genet, Jul 2016

A survey of best practices for RNA-seq data analysis

Conesa A, Madrigal P, Tarazona S, Gomez-Cabrero D, Cervera A, *McPherson A*, Szczesniak MW, Gaffney DJ, Elo LL, Zhang X, Mortazavi A

► Genome Biol, Jan 2016

2015

Spatial genomic heterogeneity within localized, multifocal prostate cancer

Boutros PC, Fraser M, Harding NJ, de Borja R, Trudel D, Lalonde E, Meng A, Hennings-Yeomans PH, *McPherson A*, Sabelnykova VY, Zia A, Fox NS, Livingstone J, Shiah Y, Wang J, Beck TA, Have CL, Chong T, Sam M, Johns J, Timms L, Buchner N, Wong A, Watson JD, Simmons TT, P'ng C, Zafarana G, Nguyen F, Luo X, Chu KC, Prokopec SD, Sykes J, Dal Pra A, Berlin A, Brown A, Chan-Seng-Yue MA, Yousif F, Denroche RE, Chong LC, Chen GM, Jung E, Fung C, Starmans MHW, Chen H, Govind SK, Hawley J, D'Costa A, Pintilie M, Waggott D, Hach F, Lambin P, Muthuswamy LB, Cooper C, Eeles R, Neal D, Tetu B, Sahinalp C, Stein LD, Fleshner N, Shah SP, Collins CC, Hudson TJ, McPherson JD, van der Kwast T, Bristow RG

► Nat Genet, Jul 2015

Clonality inference in multiple tumor samples using phylogeny

Malikic S, *McPherson AW*, Donmez N, Sahinalp CS

► Bioinformatics, May 2015

Joint Inference of Genome Structure and Content in Heterogeneous Tumor Samples

McPherson A, Roth A, Chauve C, Sahinalp SC

► RECOMB 2015, Warsaw, Poland

Dynamics of genomic clones in breast cancer patient xenografts at single-cell resolution

Eirew P, Steif A, Khattra J, Ha G, Yap D, Farahani H, Gelmon K, Chia S, Mar C, Wan A, Laks E, Biele J, Shumansky K, Rosner J, *McPherson A*, Nielsen C, Roth AJL, Lefebvre C, Bashashati A, de Souza C, Siu C, Aniba R, Brimhall J, Oloumi A, Osako T, Bruna A, Sandoval JL, Algara T, Greenwood W, Leung K, Cheng H, Xue H, Wang Y, Lin D, Mungall AJ, Moore R, Zhao Y, Lorette J, Nguyen L, Huntsman D, Eaves CJ, Hansen C, Marra MA, Caldas C, Shah SP, Aparicio S

► Nature, Feb 2015

- 2014 **TITAN: inference of copy number architectures in clonal cell populations from tumor whole-genome sequence data**
 Ha G, Roth A, Khattra J, Ho J, Yap D, Prentice LM, Melnyk N, *McPherson A*, Bashashati A, Laks E, Biele J, Ding J, Le A, Rosner J, Shumansky K, Marra MA, Gilks CB, Huntsman DG, McAlpine JN, Aparicio S, Shah SP
 ► Genome Res, Nov 2014
- Heterogeneity in the inter-tumor transcriptome of high risk prostate cancer**
 Wyatt AW, Mo F, Wang K, McConeghy B, Brahmbhatt S, Jong L, Mitchell DM, Johnston RL, Haegert A, Li E, Liew J, Yeung J, Shrestha R, Lapuk AV, *McPherson A*, Shukin R, Bell RH, Anderson S, Bishop J, Hurtado-Coll A, Xiao H, Chinnaiyan AM, Mehra R, Lin D, Wang Y, Fazli L, Gleave ME, Volik SV, Collins CC
 ► Genome Biol, Aug 2014
- Genomic rearrangements involving programmed death ligands are recurrent in primary mediastinal large B-cell lymphoma**
 Twa DDW, Chan FC, Ben-Neriah S, Woolcock BW, Mottok A, Tan KL, Slack GW, Gunawardana J, Lim RS, *McPherson AW*, Kridel R, Telenius A, Scott DW, Savage KJ, Shah SP, Gascoyne RD, Steidl C
 ► Blood, Mar 2014
- 2012 **Poly-gene fusion transcripts and chromothripsis in prostate cancer**
 Wu C, Wyatt AW, *McPherson A*, Lin D, McConeghy BJ, Mo F, Shukin R, Lapuk AV, Jones SJM, Zhao Y, Marra MA, Gleave ME, Volik SV, Wang Y, Sahinalp SC, Collins CC
 ► Genes Chromosomes Cancer, Dec 2012
- nFuse: discovery of complex genomic rearrangements in cancer using high-throughput sequencing**
McPherson A, Wu C, Wyatt AW, Shah S, Collins C, Sahinalp SC
 ► Genome Res, Nov 2012
 ► RECOMB 2012, Barcelona, Spain
- From sequence to molecular pathology, and a mechanism driving the neuroendocrine phenotype in prostate cancer**
 Lapuk AV, Wu C, Wyatt AW, *McPherson A*, McConeghy BJ, Brahmbhatt S, Mo F, Zoubeidi A, Anderson S, Bell RH, Haegert A, Shukin R, Wang Y, Fazli L, Hurtado-Coll A, Jones EC, Hach F, Hormozdiari F, Hajirasouliha I, Boutros PC, Bristow RG, Zhao Y, Marra MA, Fanjul A, Maher CA, Chinnaiyan AM, Rubin MA, Beltran H, Sahinalp SC, Gleave ME, Volik SV, Collins CC
 ► J Pathol, Jul 2012
- The clonal and mutational evolution spectrum of primary triple-negative breast cancers**
 Shah SP, Roth A, Goya R, Oloumi A, Ha G, Zhao Y, Turashvili G, Ding J, Tse K, Haffari G, Bashashati A, Prentice LM, Khattra J, Burleigh A, Yap D, Bernard V, *McPherson A*, Shumansky K, Crisan A, Giuliany R, Heravi-Moussavi A, Rosner J, Lai D, Birol I, Varhol R, Tam A, Dhalla N, Zeng T, Ma K, Chan SK, Griffith M, Moradian A, Cheng SG, Morin GB, Watson P, Gelmon K, Chia S, Chin S, Curtis C, Rueda OM, Pharoah PD, Damaraju S, Mackey J, Hoon K, Harkins T, Tadigotla V, Sigaroudinia M, Gascard P, Tlsty T, Costello JE, Meyer IM, Eaves CJ, Wasserman WW, Jones S, Huntsman D, Hirst M, Caldas C, Marra MA, Aparicio S
 ► Nature, Jun 2012

Integrated genome and transcriptome sequencing identifies a novel form of hybrid and aggressive prostate cancer

Wu C, Wyatt AW, Lapuk AV, *McPherson A*, McConeghy BJ, Bell RH, Anderson S, Haegert A, Brahmabhatt S, Shukin R, Mo F, Li E, Fazli L, Hurtado-Coll A, Jones EC, Butterfield YS, Hach F, Hormozdiari F, Hajirasouliha I, Boutros PC, Bristow RG, Jones SJ, Hirst M, Marra MA, Maher CA, Chinnaiyan AM, Sahinalp SC, Gleave ME, Volik SV, Collins CC

► J Pathol, May 2012

14-3-3 fusion oncogenes in high-grade endometrial stromal sarcoma

Lee C, Ou W, Mariño-Enriquez A, Zhu M, Mayeda M, Wang Y, Guo X, Brunner AL, Amant F, French CA, West RB, McAlpine JN, Gilks CB, Yaffe MB, Prentice LM, *McPherson A*, Jones SJM, Marra MA, Shah SP, van de Rijn M, Huntsman DG, Dal Cin P, Debiec-Rychter M, Nucci MR, Fletcher JA

► Proc Natl Acad Sci U S A, Jan 2012

2011 **Simultaneous structural variation discovery among multiple paired-end sequenced genomes**

Hormozdiari F, Hajirasouliha I, *McPherson A*, Eichler EE, Sahinalp SC

► Genome Res, Dec 2011

► RECOMB 2011, Vancouver, Canada

Comprehensive analysis of mammalian miRNA* species and their role in myeloid cells

Kuchenbauer F, Mah SM, Heuser M, *McPherson A*, Rüschmann J, Rouhi A, Berg T, Bullinger L, Argiropoulos B, Morin RD, Lai D, Starczynowski DT, Karsan A, Eaves CJ, Watahiki A, Wang Y, Aparicio SA, Ganser A, Krauter J, Döhner H, Döhner K, Marra MA, Camargo FD, Palmqvist L, Buske C, Humphries RK

► Blood, Sep 2011

Comrad: detection of expressed rearrangements by integrated analysis of RNA-Seq and low coverage genome sequence data

McPherson A, Wu C, Hajirasouliha I, Hormozdiari F, Hach F, Lapuk A, Volik S, Shah S, Collins C, Sahinalp SC

► Bioinformatics, Jun 2011

deFuse: an algorithm for gene fusion discovery in tumor RNA-Seq data

McPherson A, Hormozdiari F, Zayed A, Giuliany R, Ha G, Sun MGF, Griffith M, Heravi Moussavi A, Senz J, Melnyk N, Pacheco M, Marra MA, Hirst M, Nielsen TO, Sahinalp SC, Huntsman D, Shah SP

► PLoS Comput Biol, May 2011

MHC class II transactivator CIITA is a recurrent gene fusion partner in lymphoid cancers

Steidl C, Shah SP, Woolcock BW, Rui L, Kawahara M, Farinha P, Johnson NA, Zhao Y, Telenius A, Neriah SB, *McPherson A*, Meissner B, Okoye UC, Diepstra A, van den Berg A, Sun M, Leung G, Jones SJ, Connors JM, Huntsman DG, Savage KJ, Rimsza LM, Horsman DE, Staudt LM, Steidl U, Marra MA, Gascoyne RD

► Nature, Mar 2011

Genome-wide identification of human microRNAs located in leukemia-associated genomic alterations

Starczynowski DT, Morin R, *McPherson A*, Lam J, Chari R, Wegrzyn J, Kuchenbauer F, Hirst M, Tohyama K, Humphries RK, Lam WL, Marra M, Karsan A

► Blood, Jan 2011

2010 **ARID1A mutations in endometriosis-associated ovarian carcinomas**

Wiegand KC, Shah SP, Al-Agha OM, Zhao Y, Tse K, Zeng T, Senz J, McConechy MK, Anglesio MS, Kalloger SE, Yang W, Heravi-Moussavi A, Giuliany R, Chow C, Fee J, Zayed A, Prentice L, Melnyk N, Turashvili G, Delaney AD, Madore J, Yip S, *McPherson AW*, Ha G, Bell L, Fereday S, Tam A, Galletta L, Tonin PN, Provencher D, Miller D, Jones SJM, Moore RA, Morin GB, Oloumi A, Boyd N, Aparicio SA, Shih I, Mes-Masson A, Bowtell DD, Hirst M, Gilks B, Marra MA, Huntsman DG

► N Engl J Med, Oct 2010

2009 **Prediction of contiguous regions in the amniote ancestral genome**

Ouangraoua A, Boyer F, *Mcpherson A*, Tannier É, Chauve C

► ISBRA 2009, Ft. Lauderdale, Florida, USA