Christopher M. Summa

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Background

Education

2002 - 2007 **Stanford University School of Medicine, CA (USA)**
NSF Postdoctoral Fellow in Bioinformatics
Advisor: Dr. Michael Levitt

1994 - 2002 **University of Pennsylvania, Philadelphia, PA (USA)**
Ph.D., Biochemistry and Molecular Biophysics
Thesis Advisor: Dr. William F. DeGrado
Thesis Title: "Computational Methodologies in *De Novo* Protein Design"

1988 - 1993 **Pennsylvania State University, University Park, PA (USA)**
Dual Degree with B.S. (with Honors) in Biochemistry and B.A. in Russian
Senior Thesis: "A Search for Isozymes of Glutamine Synthetase in Human Brain"

Experience

2007 - present **Assistant Professor of Computer Science**
University of New Orleans, New Orleans, LA (USA)

2007 - present **Assistant Professor**
Research Institute for Children, New Orleans, LA (USA)

Scholarly and Creative Productivity

1. Publications

A. Books

N/A

B. Refereed/Invited Publications

Craig RB, Summa CM, Corti M, and Pincus S "Anti-HIV Double Variable Domain Immunoglobulins Binding Both gp41 and gp120 for Targeted Delivery of Immunoconjugates" PLoS ONE **7**(10) : e46778. doi:10.1371/journal.pone.0046778 (2012)

Garay J, D'Angelo JA, Park YK, Summa, CM, Aiken ML, Morales E, Badizadegan K, Fiebiger E, and Dickinson BL, "Crosstalk between PKA and Epac Signaling Regulates the Functional Maturation of Human Dendritic Cells" Journal of Immunology **185**(6), 3227-38 (2010)

Chopra, G, Summa CM and Levitt M, "Solvent Dramatically Affects Protein Structure Refinement", *PNAS* **105**, 20239-20244 (2008)

Zhao Z, Fu B, Alanis FJ, Summa CM, "Feedback Algorithm and Web-Server for Protein Structure Alignment", Journal of Computational Biology, **15**, 505-524 (2008)

Zhao Z, Fu B, Alanis FJ, Summa CM, "Feedback Algorithm and Web-Server for Protein Structure Alignment", Comput. Syst. Bioinformatics Conf., **7**, 109-120 (2008)

Summa CM and Levitt M, "Near-Native Structure Refinement Using *In Vacuo* Energy Minimization" *PNAS* **104**, 3177-3182 (2007)

Summa CM, Levitt M, and DeGrado WF, "An Atomic Environment Potential for use in Protein Structure Prediction" *J. Mol. Biol.*, **352**, 986-1001 (2005)

*Slovic AM, Summa CM, Lear JD, DeGrado WF, "Computational Design of a Water-Soluble Analog of Phospholamban" *Protein Science*, **12**, 337-348 (2003)

*Summa CM, Rosenblatt M, Hong JK, Lear, JD, DeGrado WF, "Computational *de novo* Design and Characterization of an A_2B_2 Di-Iron Protein" *J. Mol. Biol.* **321,** 923-938 (2002)

North B, Summa CM, Ghirlanda G, and DeGrado WF, "D_n-Symmetrical Tertiary Templates for the Design of Tubular Proteins" *J. Mol. Biol.* **311**, 1081-1090 (2001)

Lombardi A, Summa CM, Geremia S, et. al., "Retrostructural Analysis of Metalloproteins: Application to the Design of a Minimal Model of Di-Iron Proteins" *PNAS* **97**, 6298-6305 (2000)

C. Other Publications

Summa CM, Lombardi A, Lewis M, DeGrado WF, "Tertiary Templates for the Design of Di-Iron Proteins," *Current Opinion in Structural Biology,* **9**, 500-508 (1999)

DeGrado WF, Summa CM, Pavone V, Nastri F, Lombardi A, "*De Novo* Design and Structural Characterization of Proteins and Metalloproteins," *Annual Review of Biochemistry,* **68**, 779-819 (1999)

(* indicates dual first-authorship)

2. Items Accepted for Publication but Not Yet Published

3. Artistic or Other Creative Contributions

I have written an object-oriented library for protein design and structure prediction, called protCAD (for protein Computer Aided Design), which I use in my studies of protein structure/function and protein design.

4. Participation at Professional Meetings

2012   **STARS Celebration** (Norfolk, VA) *August*

Pediatrics Research Day
poster presentation "Modeling of the HIV GP160 Protein Complex", Manuel Zubieta, Ryan B. Craig, Seth Pincus, and Christopher Summa (*June*)

UL Academic Summit
undergraduate research talk "Modeling of the HIV GP160 Protein Complex" Manuel Zubieta and Christopher M. Summa (April)

2011   **LSUHSC Graduate Research Day**
poster presentation "Modeling an alternative UBCH7 binding site on HECT-E6AP ubiquiting ligase" Virginia P. Ronchi, Christopher M. Summa, and Arthur Haas (November)

2010   **3rd CCT/LBRN Workshop on Computational Biology (LSU)**
(invited talk "Structure Refinement of Integral Membrane Proteins") *March 26*

Pediatrics Research Day (Children's Hospital of New Orleans)
(poster presentation) *June*

18 Annual International Conference on Intelligent Systems for Molecular Biology, ISBM (Boston, MA)
(poster presentation) *July 12*

| 2009 | **Pediatrics Research Day (Children's Hospital of New Orleans)** |
| | (poster presentation) *June* |

| 2008 | **Pediatrics Research Day (Children's Hospital of New Orleans)** |
| | (poster presentation) *June* |

2006	**Protein Society Meeting (San Diego California)**
	(poster presentation)
	Critical Assessment of Protein Structure Prediction (CASP7)
	(predictor, poster presentation, lecture)

| 2002 | **Critical Assessment of Protein Structure Prediction (CASP5)** |
| | (predictor, poster presentation) |

5. Other Scholarly or Creative Activities

A. Service in role of discussant, critic, reviewer for professional meeting or publications

Reviewer for: Bioinformatics, Biopolymers, Proteins: Structure, Function and Bioinformatics, and the Proceedings of the National Academy of Sciences, MCBIOS Conference (2008-2012)

Book Chapter Review: for book "Structural Analysis of Complex Networks" (2010)

B. Service in role of officer of professional organization, program committee member, session organizer for professional meeting

N/A

C. General editorship of journal, monograph series, book series

N/A

D. Professional society membership

Protein Society, American Association for the Advancement of Science, Association for Computing Machinery, American Chemical Society

6. Awards, Lectureships, or Prizes

2010, 2012	**University of New Orleans "University Honors Mentor Award"**
2002-2004	**NSF Fellow in Biological Informatics (Individual Fellowship)**
2001	**Program in Mathematics and Molecular Biology (PMMB) Fellowship (declined)**
1997	**George W. Raiziss Teaching Fellow**
1996-1999	**Graduate Training Fellowship, National Institutes of Health**
1988-1993	**University Scholars Program:**
	• Chosen for advanced study in Honors coursework based on academic performance
	Academic Excellence Scholarship:
	• Selected from top 10% of the University Scholars based on academic merit
	Braddock Scholar of the Eberly College of Science:
	• Awarded full reimbursement of all academic expenses as incoming freshman

7. Grants and Contracts

A – Grants and Contracts Received

a) Principal Investigator

"Conformational Analysis of Therapeutic Antiviral Peptides" Louisiana EPSCoR OPT-IN **$14,570** - (June 2012 – June 2013) Principal Investigator – Christopher Summa, in collaboration with Autoimmune Technologies of New Orleans, LA

"Refinement of Integral Membrane Protein Structure Predictions" Louisiana Optical Network Initiative 4 Mo. Effort on the part of Zhiyu Zhao (June 2009 – September 2009) Principal Investigator – Christopher Summa, with co-PIs Stephen W. Rick and Zhiyu Zhao

"Developing a Multidisciplinary Program for Molecular Simulation, Visualization, and Engineering" Louisiana Board of Regents Enhancement, **$169,988** (July 1, 2008 – June 30, 2009) Principal Investigator – Christopher Summa, with co-PIs Stephen Winters-Hilt, Mahdi Abdelguerfi, and Stephen W. Rick.

"**Graduate Student Services Agreement (Arjun Sharma)**". Source: Research Institute for Children. Amount: $3,600. Approved: March 2010. Funding Period: May 17, 2010 to August 13, 2010. PI: Christopher Summa.

"Summer Salary Professional Service Agreement". Source: Research Institute for Children. Amount: $36,080. Approved: March 2010. Funding Period: May 17, 2010 to August 13, 2010. PI: Christopher Summa.

"**Graduate Student Services Agreement (Austin Orgah)**". Source: Research Institute for Children. Amount: $8,000. Approved: June 2009. Funding Period: Jan 1, 2010 to August 13, 2010. PI: Christopher Summa.

"**Graduate Student Services Agreement (Kapil Pothakanoori)**". Source: Research Institute for Children. Amount: $12,000. Approved: June 2009. Funding Period: August 17, 2009 to August 13, 2010. PI: Christopher Summa.

"Summer Salary Professional Service Agreement". Source: Research Institute for Children. Amount: $36,080. Approved: Feb 2009. Funding Period: May 17, 2009 to August 13, 2009. PI: Christopher Summa.

"**Graduate Student Services Agreement (Subhashini Puttagunta)**". Source: Research Institute for Children. Amount: $6,744. Approved: Jan 2009. Funding Period: Jan 5, 2009 to May 15, 2010. PI: Christopher Summa.

"Summer Salary Professional Service Agreement". Source: Research Institute for Children. Amount: $34,440. Approved: May 2008. Funding Period: May 17, 2008 to August 13, 2008. PI: Christopher Summa.

"**Graduate Student Services Agreement (Kapil Pothakanoori)**". Source: Research Institute for Children. Amount: $12,000. Approved: June 2008. Funding Period: August 17, 2008 to August 13, 2009. PI: Christopher Summa.

"Conformational Analysis of Therapeutic Antiviral Peptides" Louisiana EPSCoR Opportunities for Partnerships in Technology with Industry $19,950 (Christopher Summa PI) funded June 2012

b) Not Principal Investigator

"Improving Drug Discovery and Biomedical Innovation using Molecular Simulations" Louisiana Board of Regents Enhancement **$127,196** (July 2010 – June 2011) Principal Investigator – David Mobley, with co-PIs Steven Rick, Christopher Summa, Thomas Bishop, Fareed Aboul-ela, Grover Waldrop, Neil McIntyre. Role: member of consortium of

computational biologists using shared computer cluster

B – Grants and Contracts Applied For

a) Principal Investigator

"Simultaneous Optimization of Potential Function and Search Strategy for Protein Structure Prediction and Refinement" NIH RC1 Subprogram $534,210 (Submitted April 2009, not funded) Principal Investigator – Christopher Summa

"Single-molecule analysis via event transduction and machine learning" NSF CDI program, $565,450 (submitted May 2009, not funded) Principal Investigator – Stephen Winters-Hilt, coPI – Christopher Summa

"CAREER - Analysis and Engineering of Symmetric Protein Interfaces -- The case of eukaryotic STATs" NSF, $754,699 (Submitted July 2009, not funded) Principal Investigator – Christopher Summa

"**Computational and Biophysical Characterization of STAT Homo- and Heterodimers**" NIH R21 Program, $275,000 (Submitted June 2009, not funded) Principal Investigator – Christopher Summa

"Automated Refinement of Near-Native Membrane-Protein Structure Models" Louisiana Board of Regents Research Competitiveness Subprogram **$121,827** (Submitted Oct. 2009, not funded) Principal Investigator – Christopher Summa

"Methods Development for Refinement of Membrane Protein Structure Models" NIH R21 $292,514 (Submitted June 2010, not funded Principal Investigator –Christopher Summa

"Double Variable-Domain Antibodies Directed Against Clostridium difficile Toxins" NIH R21 $275,000 (Submitted June 2012) not funded

"CAREER - Computational Design of Multifunctional Synthetic Antibodies" NSF, $801,573 (Submitted July 2012, not funded) Principal Investigator – Christopher Summa

b) Not Principal Investigator

"Administrative Supplements Providing Summer Research Experiences for Students and Science Educators (NOT-OD-09-060) for NLM grant R21 LM010137 (PI: Dongxiao Zhu)" NIH $199,720 (Submitted April 2010, partially funded) Principal Investigator – Dongxiao Zhu, Co-PIs Mahdi Abdelguerfi, Shengru Tu, Golden Richard, Christopher Summa, Zhiyu Zhao, Kun Zhang, Andrea Edwards

"TWC: Medium: Collaborative: Shapeshifting Clouds-Resilience via Massive VM Diversity" NSF $787,897 (Golden G. Richard III (PI), Sandeep Gupta (PI), Vassil Roussev (co-I), Christopher Summa (co-I) and Georgious Varsamopolous (co-I)) not funded

"BIGDATA: Small: DCM: ESCE: New Storage and Fast Retrieval Methods for High-throughput Microbial Community Sequencing Data" NSF $759,568 (Christopher Taylor (PI) and Christopher Summa (co-I)) submitted July 2012 (Not funded)

"TC-Small-Virtual Machine Introspection-based Live Forensics for Detection of Malicious Software" NSF $498,984 (Golden G. Richard III (PI), Christopher Summa (co-I), and Irfan Ahmed (co-I)) submitted Nov. 2012 (pending)

8. Thesis/Dissertation Committee Service

Zhiyu (Sylvia) Zhao (Ph.D. CSCI) "***Robust and Efficient Algorithms for Protein 3D Structure Aligment and Genome Sequence Comparison***" – served as major professor for dissertation

Kenneth Charles Armond (MS CSCI) "***Distributed Support Vector Machine Learning***" – served as committee member (7/1/08)

Sam Merat (MS CSCI) "***Clustering via Supervised Support Vector Machines***" – served as committee member (7/9/08)

Sichu Li (MS CSCI) "***Application of Machine Learning Techniques for Real-time Classification of Sensor Array Data***" - served as committee member (4/10/09)

Patrick Trahan (MS CSCI) "***Classification of Carpiodes Using Fourier Descriptors of 15 Known Landmarks: A Content Based Image Retrieval Approach***" – served as committee member (4/10/09)

Carl Baribault (Ph.D. CSCI) – "***Meta State Generalized HMM for Eukaryotic Gene Structure Identification***" - served as committee member (11/4/09)

Zuliang Jiang (Ph.D. CSCI) "***Hidden Markov Model with Binned Duration and its Applications***" – served as committee member (2/25/10)

Rushikesh Digambar Kale (MS candidate CSCI) "***Development of an Interactive, Hands-on Learning Experience for the Google Maps API***" (4/9/10) served as committee member

Jessica Richard (Ph.D. candidate LSUHSC) – Preliminary Exam Committee and Thesis Committee (6/2010) served on preliminary exam committee

June D'Angelo (Ph.D. Candiate, LSUHSC) – "***Functional Characterization of the Cystine/Glutamate Antiporter in Dendritic Cells***" Preliminary Exam Committee and Thesis Committee (9/16/09 and 2/24/10, dissertation successfully defended June 25, 2010)

Kapil Pothakanoori (M.S. CSCI) "***Web Services for Protein Refinement and Refinement of Membrane Proteins***" served as thesis advisor (Fall 2010)

Austin Ada Orgah (M.S. CSCI) "***Toward a Database of Geometric Interrelationships of Protein Secondary Structure Elements for De Novo Protein Design, Prediction and Analysis***" (Fall 2010)

Joseph Coco (M.S. CSCI) "***PARSES: A Pipeline for Analysis of RNA-Sequencing Exogenous Sequences***" – served as committee member (4/4/11)

Lipi Rani Acharya (Ph.D. DENAS) "***Multivariate Models and Algorithms for Systems Biology***"- served as committee member (10/27/2011)

A. Murat Eren (Ph.D. CSCI) "***Assessing Microbial Diversity Through Nucleotide Variation***" - served as committee member (4/6/11)

Thair Judeh (M.S. CSCI) "***SEA: a novel computational and GUI software pipeline for detecting activated biological sub-pathways***" – served as committee member (6/30/2011)

Adam David Loup (M.S. CSCI) "***A Software Framework for Augmentative and Alternative Communication***" - served as committee member (3/27/2012)

Shuai Liu (UNO Chemistry) – General Exam Committee (6/7/2012)

Guorong Xu (Ph.D. DENAS) "***RNA CoMPASS: RNA Comprehensive Multi-Processor Analysis System for Sequencing***" - served as committee member (6/18/2012)

Alexis Lee (Ph.D. UNO Chemistry) "*Theoretical approaches to the characterization of water, aqueous interfaces, and improved sampling of protein conformational changes*" - served as committee member (6/27/2012)

9. Major Areas of Creative or Research Interest

I am interested in protein structure and function, using both computational and experimental approaches to increase our understanding of the energetics and dynamics of biological macromolecules, as well as design of novel macromolecules as experimental tools or novel therapeutics for human disease.

10. Other Professional Accomplishments

A – Manuscripts under submission

B – Course/Program design and development

CSCI Concentration in Game Development - a new concentration was developed in collaboration with Adlai DePano to capitalize on student interest in game development. Two new courses, below were developed by myself, and the concentration further involves two courses in mobile platform development.

CSCI 4670/4670G - Fundamentals of Game Development - a new introductory course in computer game design and development

CSCI 4675/4675G - Advanced Game Development- a new advanced course in computer game design and development

CSCI 4631/4631G – Principles of Computer Graphics – this course had not been taught for some years and redesigning it around modern graphics techniques required considerable effort.

CSCI 6631 – Advanced Computer Graphics – this graduate level course had not been taught for some years and redesigning it around modern graphics techniques required considerable effort.

Computers In Biomedical Sciences (UNO-CIBS) Outreach for Local Secondary students – (pilot May 2010) together with Dr. Stephen Rick (CHEM), Dr. David Mobley (CHEM), Dr. Chris Taylor (CSCI) and Dr. Dongxiao Zhu (CSCI). A half-day hands-on workshop was developed to introduce local high school and elementary students to the uses of computational tools in biomedical/chemical applications. A pilot program was run in May 2010 with a group of 10 students from Benjamin Franklin High School. This workshop will be offered to groups of students from other High Schools during the school year for the foreseeable future.

C – Special recognition for teaching

2012 - UNO University Honors Mentor Award
2010 - UNO University Honors Mentor Award

D – Academic Service

a. On-campus

2012 - Faculty Liaison, STARS Computing Corps
2011 – 2012 – Chair, Bioinformatics Faculty Search Committee
2011 – Co-Chair, CSCI IT Director Search Committee
2009-Present – CSCI Representative, Get to Know UNO
2008-Present – Computer Science Undergraduate Curriculum Committee
2008-Present – UNO ACM Faculty Advisor
Assisted ACM officers with organization of membership and paperwork, organized and helped train a team of students from LONI member institutions to compete in SC09 programming competition, which represented about 8 hours/week of active engagement with the student team, who met 3 times per week.

b. Off campus

2007-Present – New Orleans Protein Folding Intergroup member
Membership in this group involves attending research talks given by other members and giving research talks on current work quarterly.

E – Other service

2012   **UNO Recruitment** - worked with Director of Admissions at UNO student recruiting event at Brother Martin High School