

# Software Disclosure & Abstract Form

This software was developed in the course of or under prime contract No. DE-AC02-05CH11231 between the U.S. Department of Energy and the University of California. This Disclosure is prepared for the Office of the Assistant General Counsel for Patents, U.S. Department of Energy.

## Summary of Software Disclosure

### Title of Software Program

**SOCEMO: Surrogate Optimization of Computationally Expensive Multi-Objective Problems**

### Short Name or Acronym:

SOCEMO

### Version No.:

17.05

## Software Disclosure category

Please select the one category that best describes the invention.

### Primary Technology Class

Advanced Computation: Other

### Description Abstract

SOCEMO is an optimization algorithm for solving computationally expensive, black-box, multi-objective optimization problems. SOCEMO uses various surrogate models to approximate the computationally expensive objective functions. Hence, derivative information, which is generally unavailable for black-box simulation objective functions, is not needed. SOCEMO aims at solving problems that have continuous variables whose upper and lower bounds are known. Other constraints, such as computationally expensive black-box constraints or computationally cheap equality or inequality constraints cannot be handled by this version, but extensions of the algorithm to these problem classes are underway. This code manual describes the MATLAB code and how you can use SOCEMO to solve your multi-objective optimization problems.

## Primary Contact

Organization

Name

Email

LBNL/CRD

Juliane Mueller

julianemueller@lbl.gov

Primary Contact Phone

510-495-2872



# Software Disclosure & Abstract Form

## Features, Advantages, and Interested Parties

Describe possible uses for the software, including commercial and non-commercial uses:

SOCOMO is intended for solving computationally expensive black-box multi-objective optimization problems with continuous variables. These problem types arise in many application and science areas where several criteria have to be optimized simultaneously. If evaluating your criteria is extremely time consuming (e.g., some hours per evaluation), SOCOMO is an appropriate solver for you.

List any companies that are or would be interested in the software:

## Funding

Type of funding - Check the applicable box(es) below & provide the requested information for the funding source(s) for this software:

Office of Advanced Scientific Research (OASCR)

Other Funding Source

A.DOE

DOE Program Manager	Address	Telephone	Email
Steven Lee	U.S. Department of Energy, SC-21, Germantown Building, 1000 Independence Ave., SW Washington, DC 20585-1290	301-903-5800	steven.lee@science.doe.gov

If no DOE Program Manager, please explain.

B. Non DOE, including Strategic Partnership Project

Funding Type	Project ID and Activity Code	BNR Code	Grant or Agreement Number	Sponsor Name	Address	Telephone	Email
Alvarez Fellowship	102646.001	KJ0401000	None	DOE-ASCR	U.S. Department of Energy, SC-21, Germantown Building, 1000 Independence Ave., SW Washington, DC 20585-1290	301-903-5800	steven.lee@science.doe.gov



# Software Disclosure & Abstract Form

LDRD	103913.001	YN0100000		LBNL			
------	------------	-----------	--	------	--	--	--

C. Other Describe:

Do you reasonably expect future or continuing funding? Yes

Source:

DOE-ASCR

**Do you intend to distribute this code outside of LBNL or UC?** Yes

If yes, when and how do you intend to distribute? *An IPO licensing associate will contact you regarding distribution.*

When: as soon as possible; How: bitbucket and my LBNL website

## Software History

**A. History:** Is the Software a later version, or a derivative of an earlier LBNL software version? No

If yes, please identify the version and describe:

### B. Third Party Related and/or Auxiliary Software:

- Does the software *include* third party software? No
- Does the software *require* the use of third party software (e.g. scripts)? Yes
- Is the software a *derivative* work of third party software? No

It is important that you identify in the table below:

- the name and version of the original third-party software
- how the third-party software is used
- if the third-party software is modified or unmodified
- name(s) of the developer(s)/licensor of the third-party software
- third-party software license type
- third-party software repository link
- If Yes, please fill out details in the table below.

Name of Original Software	Version	How used, e.g., Dynamic/Static library, tool	Modified or Unmodified?	Name of Developer/Licensor	License Type e.g., BSD, GPL, MIT	Repository Link.
<b>MATLAB</b>	<b>2012(a) or later</b>	<b>computing environment for running the codes</b>	<b>unmodified</b>	<b>Mathworks</b>		<b><a href="https://www.mathworks.com/">https://www.mathworks.com/</a></b>



INNOVATION AND  
PARTNERSHIPS OFFICE

# Software Disclosure & Abstract Form

- C. Was any portion of the software written by a subcontractor or non-LBNL employee** (including developers listed on this form who were not employed at LBNL at the time the code was written)?

No

If Yes

- a. Please supply the name(s) and contact information in the below table.
- b. Please attach the actual Subcontract Agreement (the "contract") to this form.

**Subcontractor Name and email**

## Export Control

Review of software for export control restrictions is a DOE requirement managed by IPO. Where possible, please provide the information requested below.

- A. Prior Export Control Review?** – Has the software or the project/contract funding the software's development (e.g. WFO, CRADA, etc.) been through export control review previously? No

If yes, please provide the prior export classification determination and indicate the author of the determination.

- B. General field of research of the software author(s) (for example, compact high density batteries)**

optimization algorithm development

- C. Does the software have a potential "dual-purpose" application in any of the following areas?**

Please indicate the best answer for each area:

1. Military/Defense/National Security No
2. Nuclear Proliferation (e.g. enrichment technology) No
3. Chemical or Biological Warfare (e.g. toxins, infectious agents) No
4. Missile Technology
5. Communications Intercepting Technology No
6. Aircraft No
7. Encryption No
8. Spacecraft or Satellites No
9. Sensors or Lasers No
10. Navigation or Avionics No
11. Submersible Vessels, UAVs or Drones No
12. Directed Energy or other Weapons No
13. Marine No

Please provide additional information here to explain any of your answers above:

- D. Background Intellectual Property?** - Does the software include any of the following:

1. Non-OSS code No

If "Yes", please list all non-OSS code and export classifications if known:



INNOVATION AND  
PARTNERSHIPS OFFICE

# Software Disclosure & Abstract Form

2. Proprietary Information (e.g. libraries, data sets, sponsor data) No  
If "Yes", please provide details and owners of the proprietary information:



# Software Disclosure & Abstract Form

**UNITED STATES DEPARTMENT OF ENERGY  
ANNOUNCEMENT OF COMPUTER SOFTWARE  
(ESTSC - The Energy Science and Technology Software Center)**  
<http://www.osti.gov/estsc/> Form DOE AN 241.4

<b>PART II: STI PRODUCT MEDIA/FORMAT and LOCATION/TRANSMISSION</b>	<b>E. References:</b> List citations of pertinent (including technical) publications by author, title, report number, barcode, or order number (if available) and date. References are to be broken down into two groupings: 1) reference documents provided with the submittal package and 2) additional background reference materials generally available.  2) Juliane Mu00fcller, "SOCEMO: Surrogate Optimization of Computationally Expensive Multi-Objective Problems", INFORMS Journal on Computing, forthcoming publication
<b>A. Hardware Requirements</b> <b>PC</b> <b>MAC</b> <b>Supercomputer</b> <b>Unix Workstation</b>	
<b>B. Software Requirements</b> 1. OPERATING SYSTEM/VERSION: 2. COMPILER/VERSION: 3. LIMITATIONS/RESTRICTIONS/TIMING REQUIREMENT ESTIMATE: 4. OTHER SPECIAL REQUIREMENTS: needs MATLAB license on user's end 5. RELATED/AUXILIARY SOFTWARE: 6. TYPE(S) OF FILES: Source Code Sample Problem Input Data User Guide Sample Problem Output Data Programmer Documentation	
<b>C. Media Type Information</b> 1. Type Electronic QUANTITY: 27 files   CAPACITY: 2. FORMAT: PC MAC 3. LOCATION/TRANSMISSION: URL:           FTP FILENAME:	



# Software Disclosure & Abstract Form

<b>D. Documentation Type Information</b> 1. TYPE: USER MANUAL 2. FORMAT: ELECTRONIC 3. LOCATION/TRANSMISSION: URL:                FTP FILENAME:	
---	--

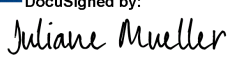
## BUSINESS REVIEW AND COPYRIGHT REGISTRATION INFORMATION

### Developer(s) Information

**Developers** – Please list the main developer who will be the main point of contact for IPO first, if multiple developers.

### Developers & electronic signatures

Contributor:

Division/Employer	Name	Email	Signature	Date
CRD	Juliane Mueller	julianemueller@lbl.gov	DocuSigned by:  7DCEAD0059044BA	5/18/2017



## Certificate of Completion

Envelope Id: 457420789A3546F7814B2DF310A7B241

Status: Completed

Subject: Please DocuSign 2017-109 ROI.pdf

Source Envelope:

Document Pages: 7

Signatures: 1

Envelope Originator:

Supplemental Document Pages: 0

Initials: 0

Jean Haemmerle

Certificate Pages: 4

AutoNav: Enabled

Payments: 0

1 Cyclotron Road, MS 56A-120

Envelopeld Stamping: Enabled

Berkeley, CA 94720

Time Zone: (UTC-08:00) Pacific Time (US & Canada)

JHaemmerle@lbl.gov

IP Address: 67.23.61.103

## Record Tracking

Status: Original

Holder: Jean Haemmerle

Location: DocuSign

5/18/2017 10:50:07 AM

JHaemmerle@lbl.gov

## Signer Events

Juliane Mueller

julianemueller@lbl.gov

Security Level: Email, Account Authentication (None)

## Signature

DocuSigned by:  
*Juliane Mueller*  
7DCFAD0059044BA...

Using IP Address: 198.128.206.36

## Timestamp

Sent: 5/18/2017 10:51:28 AM

Viewed: 5/18/2017 12:47:48 PM

Signed: 5/18/2017 12:48:19 PM

Electronic Record and Signature Disclosure:

Accepted: 5/18/2017 12:47:48 PM

ID: 6c8b125e-c897-4253-9d10-cd053b3638c9

## In Person Signer Events

## Signature

## Timestamp

## Editor Delivery Events

## Status

## Timestamp

## Agent Delivery Events

## Status

## Timestamp

## Intermediary Delivery Events

## Status

## Timestamp

## Certified Delivery Events

## Status

## Timestamp

## Carbon Copy Events

## Status

## Timestamp

## Notary Events

## Timestamp

## Envelope Summary Events

## Status

## Timestamps

Envelope Sent

Hashed/Encrypted

5/18/2017 10:51:28 AM

Certified Delivered

Security Checked

5/18/2017 12:47:48 PM

Signing Complete

Security Checked

5/18/2017 12:48:19 PM

Completed

Security Checked

5/18/2017 12:48:19 PM

## Payment Events

## Status

## Timestamps

## Electronic Record and Signature Disclosure



## **ELECTRONIC RECORD AND SIGNATURE DISCLOSURE**

From time to time, Carahsoft OBO Lawrence Berkeley National Lab (we, us or Company) may be required by law to provide to you certain written notices or disclosures. Described below are the terms and conditions for providing to you such notices and disclosures electronically through your DocuSign, Inc. (DocuSign) Express user account. Please read the information below carefully and thoroughly, and if you can access this information electronically to your satisfaction and agree to these terms and conditions, please confirm your agreement by clicking the 'I agree' button at the bottom of this document.

### **Getting paper copies**

At any time, you may request from us a paper copy of any record provided or made available electronically to you by us. For such copies, as long as you are an authorized user of the DocuSign system you will have the ability to download and print any documents we send to you through your DocuSign user account for a limited period of time (usually 30 days) after such documents are first sent to you. After such time, if you wish for us to send you paper copies of any such documents from our office to you, you will be charged a \$0.00 per-page fee. You may request delivery of such paper copies from us by following the procedure described below.

### **Withdrawing your consent**

If you decide to receive notices and disclosures from us electronically, you may at any time change your mind and tell us that thereafter you want to receive required notices and disclosures only in paper format. How you must inform us of your decision to receive future notices and disclosure in paper format and withdraw your consent to receive notices and disclosures electronically is described below.

### **Consequences of changing your mind**

If you elect to receive required notices and disclosures only in paper format, it will slow the speed at which we can complete certain steps in transactions with you and delivering services to you because we will need first to send the required notices or disclosures to you in paper format, and then wait until we receive back from you your acknowledgment of your receipt of such paper notices or disclosures. To indicate to us that you are changing your mind, you must withdraw your consent using the DocuSign 'Withdraw Consent' form on the signing page of your DocuSign account. This will indicate to us that you have withdrawn your consent to receive required notices and disclosures electronically from us and you will no longer be able to use your DocuSign Express user account to receive required notices and consents electronically from us or to sign electronically documents from us.

### **All notices and disclosures will be sent to you electronically**

Unless you tell us otherwise in accordance with the procedures described herein, we will provide electronically to you through your DocuSign user account all required notices, disclosures, authorizations, acknowledgements, and other documents that are required to be provided or made available to you during the course of our relationship with you. To reduce the chance of you inadvertently not receiving any notice or disclosure, we prefer to provide all of the required notices and disclosures to you by the same method and to the same address that you have given us. Thus, you can receive all the disclosures and notices electronically or in paper format through the paper mail delivery system. If you do not agree with this process, please let us know as described below. Please also see the paragraph immediately above that describes the consequences of your electing not to receive delivery of the notices and disclosures electronically from us.

**How to contact Carahsoft OBO Lawrence Berkeley National Lab:**

You may contact us to let us know of your changes as to how we may contact you electronically, to request paper copies of certain information from us, and to withdraw your prior consent to receive notices and disclosures electronically as follows:

To contact us by email send messages to: [mnagata@lbl.gov](mailto:mnagata@lbl.gov)

**To advise Carahsoft OBO Lawrence Berkeley National Lab of your new e-mail address**

To let us know of a change in your e-mail address where we should send notices and disclosures electronically to you, you must send an email message to us at [mnagata@lbl.gov](mailto:mnagata@lbl.gov) and in the body of such request you must state: your previous e-mail address, your new e-mail address. We do not require any other information from you to change your email address..

In addition, you must notify DocuSign, Inc to arrange for your new email address to be reflected in your DocuSign account by following the process for changing e-mail in DocuSign.

**To request paper copies from Carahsoft OBO Lawrence Berkeley National Lab**

To request delivery from us of paper copies of the notices and disclosures previously provided by us to you electronically, you must send us an e-mail to [mnagata@lbl.gov](mailto:mnagata@lbl.gov) and in the body of such request you must state your e-mail address, full name, US Postal address, and telephone number. We will bill you for any fees at that time, if any.

**To withdraw your consent with Carahsoft OBO Lawrence Berkeley National Lab**

To inform us that you no longer want to receive future notices and disclosures in electronic format you may:

- i. decline to sign a document from within your DocuSign account, and on the subsequent page, select the check-box indicating you wish to withdraw your consent, or you may;
- ii. send us an e-mail to [mnagata@lbl.gov](mailto:mnagata@lbl.gov) and in the body of such request you must state your e-mail, full name, US Postal Address, telephone number, and account number. We do not need any other information from you to withdraw consent.. The consequences of your withdrawing consent for online documents will be that transactions may take a longer time to process..

**Required hardware and software**

Operating Systems:	Windows2000? or WindowsXP?
Browsers (for SENDERS):	Internet Explorer 6.0? or above
Browsers (for SIGNERS):	Internet Explorer 6.0?, Mozilla FireFox 1.0, NetScape 7.2 (or above)
Email:	Access to a valid email account
Screen Resolution:	800 x 600 minimum
Enabled Security Settings:	<ul style="list-style-type: none"><li>•Allow per session cookies</li><li>•Users accessing the internet behind a Proxy Server must enable HTTP 1.1 settings via proxy connection</li></ul>

\*\* These minimum requirements are subject to change. If these requirements change, we will provide you with an email message at the email address we have on file for you at that time providing you with the revised hardware and software requirements, at which time you will have the right to withdraw your consent.

**Acknowledging your access and consent to receive materials electronically**

To confirm to us that you can access this information electronically, which will be similar to other electronic notices and disclosures that we will provide to you, please verify that you were able to read this electronic disclosure and that you also were able to print on paper or electronically save this page for your future reference and access or that you were able to e-mail this disclosure and consent to an address where you will be able to print on paper or save it for your future reference and access. Further, if you consent to receiving notices and disclosures exclusively in electronic format on the terms and conditions described above, please let us know by clicking the 'I agree' button below.

By checking the 'I Agree' box, I confirm that:

- I can access and read this Electronic CONSENT TO ELECTRONIC RECEIPT OF ELECTRONIC RECORD AND SIGNATURE DISCLOSURES document; and
- I can print on paper the disclosure or save or send the disclosure to a place where I can print it, for future reference and access; and
- Until or unless I notify Carahsoft OBO Lawrence Berkeley National Lab as described above, I consent to receive from exclusively through electronic means all notices, disclosures, authorizations, acknowledgements, and other documents that are required to be provided or made available to me by Carahsoft OBO Lawrence Berkeley National Lab during the course of my relationship with you.