Document Number: P2888R0
Date: 2023-05-15
Authors: Michael Wong
Project: Programming Language C++, SG19 Machine Learning
Reply to: Michael Wong <michael@codeplay.com>

SG19: Machine Learning virtual Meeting Minutes to 2023/05/12

Contents

Minutes for 2023/03/09 SG19 Conference Call

On Tue, Mar 7, 2023 at 11:19 AM Michael Wong <fraggamuffin_at_[hidden]> wrote:
> Hi all, SG19 Machine Learning meeting will focus on Matrix. We still want
> to drive graph and stats to completion and we can have brief moments to
> review where they are depending on how much Matrix takes up. Are there any
> other suggested topics? Thank you.
>
>
> Michael Wong is inviting
> you to a scheduled Zoom meeting.
>
> Topic: SG19 monthly
> Time: 02:00 PM Eastern Time (US and Canada)
> Every month on the Second Thu,
>
>
> Join from PC, Mac, Linux, iOS or Android:
>
> https://iso.zoom.us/j/93084591725?pwd=K3QxZjJlcnljaE13ZWU5cTlLNkx0Zz09
> Password: 035530
>
> Or iPhone one-tap :
> US: +13017158592,,93084591725# or +13126266799,,93084591725#
> Or Telephone:
> Dial(for higher quality, dial a number based on your current location):
> US: +1 301 715 8592 or +1 312 626 6799 or +1 346 248 7799 or +1
> 408 638 0968 or +1 646 876 9923 or +1 669 900 6833 or +1 253 215 8782

> or 877 853 5247 (Toll Free)
> Meeting ID: 930 8459 1725
> Password: 035530
> International numbers available: https://iso.zoom.us/u/agewu4X97
>
> Or Skype for Business (Lync):
> https://iso.zoom.us/skype/93084591725
>
> Agenda:
>
> 1. Opening and introductions
>
> The ISO Code of conduct:
> https://www.iso.org/files/live/sites/isoorg/files/store/en/PUB100397.pdf
>
> IEC Code of Conduct:
>
> https://www.iec.ch/basecamp/iec-code-conduct-technical-work
>
> ISO patent policy.
>
>
>
https://isotc.iso.org/livelink/livelink/fetch/2000/2122/3770791/Common_Policy.htm?nodeid=6344764&vernum=-2
>
> The WG21 Practices and Procedures and Code of Conduct:
>
> https://isocpp.org/std/standing-documents/sd-4-wg21-practices-and-procedures
>
> 1.1 Roll call of participants
>
Guy Davidson, Phil Ratzloff, Scott Macmillan, Dounia Khaldi,
Benjamin Brock, Boguslaw Cyganek, Jens Maurer, Nathan Owen, Oliver Rosten,
Rene Rivera, Richard Dosselmann, Michael Wong, Mohammed Osama

>
>
> 1.2 Adopt agenda
>
> 1.3 Approve minutes from previous meeting, and approve publishing
> previously approved minutes to ISOCPP.org
>
> 1.4 Action items from previous meetings
>
> 2. Main issues (125 min)
>
> 2.1 General logistics
>

> Meeting plan, focus on one paper per meeting but does not preclude other
> paper
> updates:
>
> CPPCON minutes:
> https://wiki.edg.com/bin/view/Wg21virtual2022-07/SG14
>
>
> Nov 10, 2022 02:00 PM ET: Cancelled due to Kona F2F
> Dec 8, 2022 02:00 PM ET: Graph
> Jan 12, 2023 02:00 PM ET: Stats
> Feb 9, 2023 02:00 PM ET: F2F cancelled
> Mar 9, 2023 02:00 PM ET: Matrix
>
>
> ISO meeting status
>
> future C++ Std meetings
>
> 2.2 Paper reviews
>
> 2.2.1: ML topics
>
> 2.2.1.1 Graph Proposal Phil Ratsloff et al
>
> Update: need a bit more time.

> Latest paper:
>
> Here's a link to the paper (different than the previous paper reviewed).
> There are some additional updates I'm planning on making before the
> meeting.
>
>
>
https://docs.google.com/document/d/1OpH-xxRri7tJTtJJIZTYmSHkkrZJkdBwm9zJ7LqolfQ/edit?usp=sharing
>
>
>
>
> P1709R3:
>
>
https://docs.google.com/document/d/1kLHhbSTX7j0tPeTYECQFSNx3R35Mu3xO5_dyYdRy4dM/edit?usp=sharing
>
>
>

https://docs.google.com/document/d/1QkfDzGyfNQKs86y053M0YHOLP6frzhTJqzg1Ug_vkkE/edit?usp=sharing
>
> <http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2020/p2119r0.html>
>
> <
>
>
https://docs.google.com/document/d/175wIm8o4BNGti0WLq8U6uZORegKVjmnpfc-_E8PoGS0/edit?ts=5fff27cd#heading=h.9ogkehmdmtel
> *>*
>
> Array copy semantics:
> array copy-semantics paper P1997 "Relaxing Restrictions on Arrays",
> https://wg21.link/p1997
>
> Stats feedback:
>
> P2376R0
> <http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2021/p2376r0.pdf>
> Comments
> on Simple Statistical Functions (p1708r4): Contracts, Exceptions and
> Special cases Johan Lundberg
>
> 2.2.1.2 Reinforcement Learning Larry Lewis Jorge Silva
>
> Reinforcement Learning proposal:
>
> 2.2.1.3 Differential Calculus:
>
>
>
https://docs.google.com/document/d/175wIm8o4BNGti0WLq8U6uZORegKVjmnpfc-_E8PoGS0/edit?ts=5fff27cd#heading=h.9ogkehmdmtel
>
> 2.2.1.4: Stats paper
>

Question from Oliver about checks constraints. Toeb discussed in future call and to post on reflector.

>
>
> P2681R0
> <https://www.open-std.org/jtc1/sc22/wg21/docs/papers/2022/p2681r0.pdf>
> More
> Stats Functions Richard Dosselmann, Michael Wong
> Current github
>

> https://github.com/cplusplus/papers/issues/475
>
> https://github.com/cplusplus/papers/issues/979
>
> Stats review Richard Dosselman et al
>
> http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2021/p1708r4.pdf
>
> Feedback from Johan Lundberg and Oleksandr Korval
>
> https://isocpp.org/files/papers/D2376R0.pdf
>
> P1708R3: Math proposal for Machine Learning: 3rd review
>
> PXXXX: combinatorics: 1st Review
>
> *> std.org/jtc1/sc22/wg21/docs/papers/2020/p1708r2
> <http://std.org/jtc1/sc22/wg21/docs/papers/2020/p1708r2>*
> *> above is the stats paper that was reviewed in Prague*
> *> http://wiki.edg.com/bin/view/Wg21prague/P1708R2SG19
> <http://wiki.edg.com/bin/view/Wg21prague/P1708R2SG19>*
> *>*
> *> Review Jolanta Polish feedback.*
> *> http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2020/p2119r0.html
> <http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2020/p2119r0.html>*
>
>
> 2.2.1.4: Matrix paper
>
> Dounia presenting:
1. Matrix proposal done in SYCL
matrix type accepted both static and dynamic, but now drops dynamic_extent
Matrix datatype
mma_engine type is new where sizes are transparent to the user
defined with a specified combination of type and size
explicit data transfers
separate memory operations and layout from compute

new fns are multiply and add operation, map function (loop over scalars, conversion to a vector)
extensible to add more operations

mma_engine gives you query and abstract away HW details
in SYCL this is in private memory in a work item, if shared with all work items, then you need a subgroup like simd which clusters these lanes to run in parallel, cluster subgroups to become work groups, and many workgroups makes up a kernel;

bulk execution is like parallel for , but has no 2d range

layout (mdspan), row major(right), column major (left)

Robert van de Geijn at University of Texas Austin
Some of Robert's work: https://github.com/flame/blis

this offers full control, but also enables fusion when you have 2 kernels that dont communicate with each other in a pipelining way, breaking it up makes it low level but gives control

gpu_execution, does P2300 serve GPU_execution? what about matrix gpu execution?

current framework seems to assume shared cpu/GPU memory

please feedback to P2300

different data types, dims, element type, can take away the a, b type, accumulator type

uint3, sint4 are not in C++

uint32_t is better as parameter or size_t as sparse matrix may have more than 32 bits, its compile info so can take larger size.

Guy Davidson:D1385R8
https://www.open-std.org/jtc1/sc22/wg21/docs/papers/2022/p1385r7.pdf
construct vectors by constructing single row
plan at Varna is to use what is presented at ACCU
COT is the storage engine and operation types

graph is a CSR graph, can this apply to this matrix, yes can put mdspan inside,
close relation in sparse matrix and graphs, talk to Christian in issaquah, and was not sure mdspan can do sparse matrix well, using vectors.

matrix synopsis shops lots of @includes, like deque, will need to trim even if the interface might requires these symbols, as all implementation need to get the full header, can just get the bits you need using a common include file
#include is not needed in synopsis

SG6 OK but did not see the vector.
LEWG waiting. may present in Varna

Correction to those minutes: SG6 in Kona were happy with the removal of vectors; they originally sent the paper to LEWG WITH vectors at Cologne or
Belfast I think, which were then subsequently removed after Prague.

2.2.3 any other proposal for reviews?
>
> 2.3 Other Papers and proposals
>
> P1416R1: SG19 - Linear Algebra for Data Science and Machine Learning
>
>
https://docs.google.com/document/d/1IKUNiUhBgRURW-UkspK7fAAyIhfXuMxjk7xKikK4Yp8/edit#heading=h.tj9hitg7dbtr
>
> P1415: Machine Learning Layered list
>
>
https://docs.google.com/document/d/1elNFdIXWoetbxjO1OKol_Wj8fyi4Z4hogfj5tLVSj64/edit#heading=h.tj9hitg7dbtr
>
> 2.2.2 SG14 Linear Algebra progress:
> Different layers of proposal
>
>
https://docs.google.com/document/d/1poXfr7mUPovJC9ZQ5SDVM_1Nb6oYAXlK_d0ljdUAtSQ/edit
>
> 2.5 Future F2F meetings:
>
> 2.6 future C++ Standard meetings:
> https://isocpp.org/std/meetings-and-participation/upcoming-meetings
>
> None
>
> 3. Any other business
>
> New reflector
>
> http://lists.isocpp.org/mailman/listinfo.cgi/sg19
>
> Old Reflector
> https://groups.google.com/a/isocpp.org/forum/#!newtopic/sg19
> <https://groups.google.com/a/isocpp.org/forum/?fromgroups=#!forum/sg14>
>
> Code and proposal Staging area
>

> 4. Review
>
> 4.1 Review and approve resolutions and issues [e.g., changes to SG's
> working draft]
>
> 4.2 Review action items (5 min)
>
> 5. Closing process
>
> 5.1 Establish next agenda
>
>
> 5.2 Future meeting
>
>
>
>
> Jan 2, 2022 02:00 PM ET: Stats
> Feb 9, 2022 02:00 PM ET: F2F Cancelled
> mar 9, 2022 02:00 PM ET: Matrix

Minutes for 2023/04/13 SG19 Conference Call

Notes
On Wed, Apr 12, 2023 at 11:33 PM Michael Wong <fraggamuffin_at_[hidden]>
wrote:

> Hi all, SG19 Machine Learning meeting will focus on Graph. We still want to
> drive graph and stats to completion. Are there any other suggested
> topics? Thank you.
>
>
> Michael Wong is inviting
> you to a scheduled Zoom meeting.
>
> Topic: SG19 monthly
> Time: 02:00 PM Eastern Time (US and Canada)
> Every month on the Second Thu,
>
>
> Join from PC, Mac, Linux, iOS or Android:
>
> https://iso.zoom.us/j/93084591725?pwd=K3QxZjJlcnljaE13ZWU5cTlLNkx0Zz09
> Password: 035530

>
> Or iPhone one-tap :
> US: +13017158592,,93084591725# or +13126266799,,93084591725#
> Or Telephone:
> Dial(for higher quality, dial a number based on your current location):
> US: +1 301 715 8592 or +1 312 626 6799 or +1 346 248 7799 or +1
> 408 638 0968 or +1 646 876 9923 or +1 669 900 6833 or +1 253 215 8782
> or 877 853 5247 (Toll Free)
> Meeting ID: 930 8459 1725
> Password: 035530
> International numbers available: https://iso.zoom.us/u/agewu4X97
>
> Or Skype for Business (Lync):
> https://iso.zoom.us/skype/93084591725
>
> Agenda:
>
> 1. Opening and introductions
>
> The ISO Code of conduct:
> https://www.iso.org/files/live/sites/isoorg/files/store/en/PUB100397.pdf
>
> IEC Code of Conduct:
>
> https://www.iec.ch/basecamp/iec-code-conduct-technical-work
>
> ISO patent policy.
>
>
>
https://isotc.iso.org/livelink/livelink/fetch/2000/2122/3770791/Common_Policy.htm?nodeid=6344764&vernum=-2
>
> The WG21 Practices and Procedures and Code of Conduct:
>
> https://isocpp.org/std/standing-documents/sd-4-wg21-practices-and-procedures
>
> 1.1 Roll call of participants
>

> Phil Ratzloff, Andrew Lumsdaine, Chris Ryan.. Nathan Owens. Oliver Rosten,
> Richard Dosselmann, Sam Obeng, Scott McMillan, Michael Wong, Rene Rivera
>

>
> 1.2 Adopt agenda
>

> 1.3 Approve minutes from previous meeting, and approve publishing
> previously approved minutes to ISOCPP.org
>
> 1.4 Action items from previous meetings
>
> 2. Main issues (125 min)
>
> 2.1 General logistics
>
> Meeting plan, focus on one paper per meeting but does not preclude other
> paper updates:
>
> CPPCON minutes:
> https://wiki.edg.com/bin/view/Wg21virtual2022-07/SG14
>
>
> Apr 13: Graph
> May 11: Stats
> June 15: Varna F2F (cancelled)
> July 13: Matrix
> Aug 10: Graph
> Sep 14: Stats
> Oct 12: Matrix
> Nov 9: Graph
>
>
> ISO meeting status
>
> future C++ Std meetings
>
> 2.2 Paper reviews
>
> 2.2.1: ML topics
>
> 2.2.1.1 Graph Proposal Phil Ratsloff et al
>
> Latest paper:
>
> Here's a link to the paper (different than the previous paper reviewed).
> There are some additional updates I'm planning on making before the
> meeting.
>
>
>
https://docs.google.com/document/d/1OpH-xxRri7tJTtJJIZTYmSHkkrZJkdBwm9zJ7LqolfQ/edit?usp=sharing
>
> D1709R4:
>

aim for Kona
1.2
Graph algorithm
Views
adaptors with cpo
goal for edge list: very useful utility class, lots of graph i/o is done
with edges

bipartite graphs are extremely useful (e.g. imdb)

is list collection confusing? its arbitrary based on implementation, yes
confusing
edge_list is a list, set, map, forward_list

https://github.com/stdgraph/P1709
has the current paper in Latex. You'll need to generate the paper

Algorithms follow standard ranges, separated into 3 tiers
T 2, 3 are paper for the future

Is there a reason we have minimum spanning tree algorithms but not minimum spanning arborecence algorithms?
like MST but for directed graphs: yes can be in both directions, may be
just a specia;ization

Should we parallelize, accelerate
yes, have a placeholder, execution_policy, allows symmetrical interface if
parameter is always there
some like dijkstra's is sequential, so parallel version is delta-stepping
E.g. chu-liu/edmonds'
DFS is inherently sequential

>
> P1709R3:
>
>
https://docs.google.com/document/d/1kLHhbSTX7j0tPeTYECQFSNx3R35Mu3xO5_dyYdRy4dM/edit?usp=sharing
>
>
>
https://docs.google.com/document/d/1QkfDzGyfNQKs86y053M0YHOLP6frzhTJqzg1Ug_vkkE/edit?usp=sharing
>
> <http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2020/p2119r0.html>
>
> <
>

>
https://docs.google.com/document/d/175wIm8o4BNGti0WLq8U6uZORegKVjmnpfc-_E8PoGS0/edit?ts=5fff27cd#heading=h.9ogkehmdmtel
> *>*
>
> Array copy semantics:
> array copy-semantics paper P1997 "Relaxing Restrictions on Arrays",
> https://wg21.link/p1997
>
> Stats feedback:
>
> P2376R0
> <http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2021/p2376r0.pdf>
> Comments
> on Simple Statistical Functions (p1708r4): Contracts, Exceptions and
> Special cases Johan Lundberg
>
> 2.2.1.2 Reinforcement Learning Larry Lewis Jorge Silva
>
> Reinforcement Learning proposal:
>
> 2.2.1.3 Differential Calculus:
>
>
>
https://docs.google.com/document/d/175wIm8o4BNGti0WLq8U6uZORegKVjmnpfc-_E8PoGS0/edit?ts=5fff27cd#heading=h.9ogkehmdmtel
>
> 2.2.1.4: Stats paper
>
> P2681R0
> <https://www.open-std.org/jtc1/sc22/wg21/docs/papers/2022/p2681r0.pdf>
> More
> Stats Functions Richard Dosselmann, Michael Wong
> Current github
>
> https://github.com/cplusplus/papers/issues/475
>
> https://github.com/cplusplus/papers/issues/979
>
> Stats review Richard Dosselman et al
>
> http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2021/p1708r4.pdf
>
> Feedback from Johan Lundberg and Oleksandr Korval
>
> https://isocpp.org/files/papers/D2376R0.pdf
>
> P1708R3: Math proposal for Machine Learning: 3rd review

>
> PXXXX: combinatorics: 1st Review
>
> *> std.org/jtc1/sc22/wg21/docs/papers/2020/p1708r2
> <http://std.org/jtc1/sc22/wg21/docs/papers/2020/p1708r2>*
> *> above is the stats paper that was reviewed in Prague*
> *> http://wiki.edg.com/bin/view/Wg21prague/P1708R2SG19
> <http://wiki.edg.com/bin/view/Wg21prague/P1708R2SG19>*
> *>*
> *> Review Jolanta Polish feedback.*
> *> http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2020/p2119r0.html
> <http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2020/p2119r0.html>*
>
> More stats paper:
>
5.2.1 mode accumulator class has ability to compare
agree to not use long name so just percentile (no of_sorted)
5.2.2 covariance accumulator class templates
use typedef because it is a mouthful
common_type_t would reduce worthiness

preconditions of variance needing 2 values, whereas mean requires 1,
another one requires 3
decided to not doing a lot of check - what kind of checks? exceptions?
optional? expected? at BSI, choose expected
if you violate preconditins, its UB
due to empty ranges
can we say the operator parenthesis been called twice? it is using outside
r, so the length is less then length of W, same length as x, y

checking or not: user has to done the right thing, e.e. binary_search
here you just count the number of invocations

A public implementation is available at ...
Choose an open source license | Choose a License
<https://choosealicense.com/>

> 2.2.1.4: Matrix paper
>
> 2.2.3 any other proposal for reviews?
>
> 2.3 Other Papers and proposals
>
> P1416R1: SG19 - Linear Algebra for Data Science and Machine Learning
>

>
https://docs.google.com/document/d/1IKUNiUhBgRURW-UkspK7fAAyIhfXuMxjk7xKikK4Yp8/edit#heading=h.tj9hitg7dbtr
>
> P1415: Machine Learning Layered list
>
>
https://docs.google.com/document/d/1elNFdIXWoetbxjO1OKol_Wj8fyi4Z4hogfj5tLVSj64/edit#heading=h.tj9hitg7dbtr
>
> 2.2.2 SG14 Linear Algebra progress:
> Different layers of proposal
>
>
https://docs.google.com/document/d/1poXfr7mUPovJC9ZQ5SDVM_1Nb6oYAXlK_d0ljdUAtSQ/edit
>
> 2.5 Future F2F meetings:
>
> 2.6 future C++ Standard meetings:
> https://isocpp.org/std/meetings-and-participation/upcoming-meetings
>
> None
>
> 3. Any other business
>
> New reflector
>
> http://lists.isocpp.org/mailman/listinfo.cgi/sg19
>
> Old Reflector
> https://groups.google.com/a/isocpp.org/forum/#!newtopic/sg19
> <https://groups.google.com/a/isocpp.org/forum/?fromgroups=#!forum/sg14>
>
> Code and proposal Staging area
>
> 4. Review
>
> 4.1 Review and approve resolutions and issues [e.g., changes to SG's
> working draft]
>
> 4.2 Review action items (5 min)
>
> 5. Closing process
>
> 5.1 Establish next agenda
>
>
> 5.2 Future meeting
> Apr 13: Graph

> May 11: Stats
> June 15: Varna F2F (cancelled)
> July 13: Matrix
> Aug 10: Graph
> Sep 14: Stats
> Oct 12: Matrix
> Nov 9: Graph
> Dec 14: Stats