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(***)Input identifying information(***)

In[ ]:= date = ToString[Evaluate[Input["Input the date of the experiment"]]]

In[ ]:= mouse = ToString[Evaluate[Input["Input the mouse identity (e.g. Mouse123)"]]]

In[ ]:= sessionNum = Evaluate[Input["Input the session number"]]

In[ ]:= (***)Import the frame times for the 2P images and calculate the frame rate(***)

In[ ]:= tpFrameTimes =
  Drop[Drop[(Import[StringJoin["S:/Imaging/Garrett/FMB208_2PRig/", date, "/",
    mouse, "/Session", ToString[sessionNum], "/", date, "_", mouse, "_",
    "Session", ToString[sessionNum], "_2PFrameTimes.txt"], "List"], 16], -1];

In[ ]:= numMovies =
  Length[FileNames["*", File[StringJoin["S:/Imaging/Garrett/FMB208_2PRig/", date,
    "/", mouse, "/Session", ToString[sessionNum], "/moco/New folder/"]]]];

In[ ]:= numFramesPerAcq = Round[Length[tpFrameTimes] / (numMovies)];

In[ ]:= tpFrameRate = Round[Mean[numFramesPerAcq / Flatten[Differences /@
  ({First[#], Last[#]} & /@ (Partition[tpFrameTimes, numFramesPerAcq])}]]];

In[ ]:= (****Cell bodies****)

numROIsCBs = Length[
  FileNames["*", File[StringJoin["S:/Imaging/Garrett/FMB208_2PRig/", date, "/", mouse,
    "/Session", ToString[sessionNum], "/dFOverF0TimeSeries_CellBodies_Unfilt/"]]]];

In[ ]:= Table[Evaluate@ToExpression[StringJoin["spikePosCB", ToString[n]]] =
  Round@Import[StringJoin["S:/Imaging/Garrett/FMB208_2PRig/", date, "/",
    mouse, "/Session", ToString[sessionNum], "/deConvFFsCellBodies/",
    "deconvSpikecb", ToString[n], ".txt"], "List"];; {n, 1, numROIsCBs}];

In[ ]:= Table[Evaluate@ToExpression[StringJoin["spikeTimesCB", ToString[n]]] =
  Table[tpFrameTimes[[i]],
    {i, ToExpression[StringJoin["spikePosCB", ToString[n]]}]];; {n, 1, numROIsCBs}];

In[ ]:= (***)Cell body firing rates(***)

In[ ]:= w = 0.1; (***)100 ms sliding window(***)

In[ ]:= Table[Evaluate@ToExpression[StringJoin["firingRateCB", ToString[n]]] =
  Table[Sum[(1 / Sqrt[2 * Pi] * w) * Exp[-((t - i)^2) / (2 * w^2)],
    {i, ToExpression[StringJoin["spikeTimesCB", ToString[n]]}]],
    {t, tpFrameTimes}];, {n, 1, numROIsCBs}];

In[ ]:= Table[Evaluate@ToExpression[StringJoin["dFFRtsCB", ToString[n]]] =
  Partition[Riffle[tpFrameTimes,
    ToExpression[StringJoin["firingRateCB", ToString[n]]], 2];, {n, 1, numROIsCBs}];

In[ ]:= Table[Evaluate@ToExpression[StringJoin["dFFRIntCB", ToString[n]]] = Interpolation[
  ToExpression[StringJoin["dFFRtsCB", ToString[n]]];, {n, 1, numROIsCBs}];

In[ ]:= (*****)

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In[ ]:= (*****Import quiescent (non-locomotion) periods*****)

In[ ]:= quiescentPeriods =
  ToExpression[Import[StringJoin["S:/Imaging/Garrett/FMB208_2PRig/", date, "/",
    mouse, "/Session", ToString[sessionNum], "/LocomotionData/", date, "_", mouse,
    "_", "Session", ToString[sessionNum], "_QuiescentBouts.txt"], "List"]];

In[ ]:= (***Truncate quiescent periods so that the cross correlation
  analysis won't include any locomotion onsets or offsets ***)

In[ ]:= quiescentPeriodsTrunc = Table[{quiescentPeriods[[n, 1]] + 8, quiescentPeriods[[n, 2]] - 8},
  {n, 1, Length[quiescentPeriods]};

In[ ]:= (***Only keep quiescent periods at least 9 s long***)

In[ ]:= quiescentPeriodsLongBef =
  DeleteCases[Table[If[quiescentPeriodsTrunc[[n, 2]] - quiescentPeriodsTrunc[[n, 1]] ≥ 9,
    quiescentPeriodsTrunc[[n]], Null], {n, 1, Length[quiescentPeriodsTrunc]}], Null];

In[ ]:= (***For each acquisition bout, determine the quiescent periods
  contained within it and then make sure they're at least 9 s long***)

In[ ]:= acqBoutIntervals =
  Interval /@ ({First[#] + 4, Last[#] - 4} & /@ (Partition[tpFrameTimes, numFramesPerAcq]));

In[ ]:= testedIntervals = Table[MinMax /@ (IntervalIntersection[acqBoutIntervals[[n]], #] & /@
  (Interval /@ quiescentPeriodsLongBef)), {n, 1, Length[acqBoutIntervals]};

In[ ]:= acceptedQuiescentPeriods = Flatten[
  Table[DeleteCases[Table[If[NumberQ@ (Differences[testedIntervals[[m, n]]][[1]]),
    testedIntervals[[m, n]], Null], {n, 1, Length[testedIntervals[[m]]}],
    Null], {m, 1, Length[testedIntervals]}], 1];

In[ ]:= quiescentPeriodsLong = DeleteCases[
  Table[If[acceptedQuiescentPeriods[[n, 2]] - acceptedQuiescentPeriods[[n, 1]] ≥ 9,
    acceptedQuiescentPeriods[[n]], Null],
  {n, 1, Length[acceptedQuiescentPeriods]}], Null];

In[ ]:= Table[
  Evaluate@ToExpression[StringJoin["acceptedSpikeTimesCB", ToString[cb]]] = DeleteCases[
    Table[If[Length[Cases[IntervalMemberQ[#, (ToExpression[StringJoin["spikeTimesCB",
      ToString[cb]]][[n]]] & /@ (Interval /@ quiescentPeriodsLong), True]] >
      0, (ToExpression[StringJoin["spikeTimesCB", ToString[cb]]][[n]], Null],
      {n, 1, Length[(ToExpression[StringJoin["spikeTimesCB", ToString[cb]]])]}],
    Null];, {cb, 1, numROIsCBs}];

In[ ]:= (*****Calculate PM cell body spike-triggered average axon dF/F,
  4s before and 4s after each spike*****

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In[ ]:= Table[Table[
  Evaluate@ToExpression[StringJoin["staDFFCB", ToString[cb], "CB", ToString[cb2]]] =
    Mean[Table[Table[(ToExpression[StringJoin["dFFIntCB", ToString[cb2]])] [t],
      {t, (ToExpression[StringJoin["acceptedSpikeTimesCB", ToString[cb]])] [[n]] - 4,
        (ToExpression[StringJoin["acceptedSpikeTimesCB", ToString[cb]])] [[n]] + 4,
        N@1/tpFrameRate}], {n, 1,
      Length[(ToExpression[StringJoin["acceptedSpikeTimesCB", ToString[cb]])]}]]];,
  {cb2, DeleteCases[Range[numROIsCBs], cb]}];, {cb, 1, numROIsCBs}];

In[ ]:= Table[
  Table[Evaluate@ToExpression[StringJoin["staFRCB", ToString[cb], "CB", ToString[cb2]]] =
    Mean[Table[Table[(ToExpression[StringJoin["dFFRIntCB", ToString[cb2]])] [t],
      {t, (ToExpression[StringJoin["acceptedSpikeTimesCB", ToString[cb]])] [[n]] - 4,
        (ToExpression[StringJoin["acceptedSpikeTimesCB", ToString[cb]])] [[n]] + 4,
        N@1/tpFrameRate}], {n, 1,
      Length[(ToExpression[StringJoin["acceptedSpikeTimesCB", ToString[cb]])]}]]];,
  {cb2, DeleteCases[Range[numROIsCBs], cb]}];, {cb, 1, numROIsCBs}];

In[ ]:= Table[Evaluate@ToExpression[StringJoin["overallDFFsta", ToString[cb]]] =
  Mean[Table[ToExpression[StringJoin["staDFFCB", ToString[cb], "CB", ToString[cb2]]],
    {cb2, DeleteCases[Range[numROIsCBs], cb]}];, {cb, 1, numROIsCBs}];

In[ ]:= Table[Evaluate@ToExpression[StringJoin["overallFRsta", ToString[cb]]] =
  Mean[Table[ToExpression[StringJoin["staFRCB", ToString[cb], "CB", ToString[cb2]]],
    {cb2, DeleteCases[Range[numROIsCBs], cb]}];, {cb, 1, numROIsCBs}];

In[ ]:= (*****Create random cb spike trains to calculate chance-
  level sta*****)

In[ ]:= (***Empirical ISI distribution***)

In[ ]:= Table[Evaluate@ToExpression[StringJoin["isiDistCB", ToString[cb]]] =
  EmpiricalDistribution[Flatten[Differences /@ Table[
    DeleteCases[Table[If[IntervalMemberQ[Interval@quiescentPeriodsLong[[bout]],
      (ToExpression[StringJoin["spikeTimesCB", ToString[cb]])] [[n]]],
      (ToExpression[StringJoin["spikeTimesCB", ToString[cb]])] [[n]], Null],
    {n, 1, Length[(ToExpression[StringJoin["spikeTimesCB", ToString[cb]])]}],
    Null], {bout, 1, Length[quiescentPeriodsLong]}]]];, {cb, 1, numROIsCBs}];

In[ ]:= (***Random ISIs drawn from empirical distributions***)

In[ ]:= Table[Evaluate@ToExpression[StringJoin["randISIs", ToString[cb]]] = RandomVariate[
  ToExpression[StringJoin["isiDistCB", ToString[cb]]], Length[ToExpression[
    StringJoin["acceptedSpikeTimesCB", ToString[cb]]]]];, {cb, 1, numROIsCBs}];

In[ ]:= (***Random spike times for each CB***)

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In[ ]:= Table[Evaluate@ToExpression[StringJoin["randSpikeTimesCB", ToString[cb]]] =
  Flatten[Table[DeleteCases[Accumulate[Prepend[RandomSample@
    (ToExpression[StringJoin["randISIs", ToString[cb]])]], quiescentPeriodsLong[[bout, 1]] +
    (RandomSample@
      (ToExpression[StringJoin["randISIs", ToString[cb]]))[[1]]],
    _? (# > quiescentPeriodsLong[[bout, 2]] &)], {bout, 1,
    Length[quiescentPeriodsLong]}]]; {cb, 1, numROIsCBs}];

In[ ]:= (*****For chance-
  level simulation: Calculate PM cell body spike-triggered average axon dF/F,
  4s before and 4s after each spike*****)

In[ ]:= Table[Table[
  Evaluate@ToExpression[StringJoin["staRandCB", ToString[cb], "CB", ToString[cb2]]] =
    Mean[Table[Table[(ToExpression[StringJoin["dFFIntCB", ToString[cb2]])] [t],
      {t, (ToExpression[StringJoin["randSpikeTimesCB", ToString[cb]])] [[n]] - 4,
      (ToExpression[StringJoin["randSpikeTimesCB", ToString[cb]])] [[n]] + 4,
      N@1/tpFrameRate}],
      {n, 1, Length[(ToExpression[StringJoin["randSpikeTimesCB", ToString[cb]])]}]]];,
  {cb2, DeleteCases[Range[numROIsCBs], cb]}]; {cb, 1, numROIsCBs}];

In[ ]:= Table[Table[
  Evaluate@ToExpression[StringJoin["staRandFRCB", ToString[cb], "CB", ToString[cb2]]] =
    Mean[Table[Table[(ToExpression[StringJoin["dFFRIntCB", ToString[cb2]])] [t],
      {t, (ToExpression[StringJoin["randSpikeTimesCB", ToString[cb]])] [[n]] - 4,
      (ToExpression[StringJoin["randSpikeTimesCB", ToString[cb]])] [[n]] + 4,
      N@1/tpFrameRate}],
      {n, 1, Length[(ToExpression[StringJoin["randSpikeTimesCB", ToString[cb]])]}]]];,
  {cb2, DeleteCases[Range[numROIsCBs], cb]}]; {cb, 1, numROIsCBs}];

In[ ]:= Table[Evaluate@ToExpression[StringJoin["overallDFFstaRand", ToString[cb]]] =
  Mean[Table[ToExpression[StringJoin["staRandCB", ToString[cb], "CB", ToString[cb2]]],
    {cb2, DeleteCases[Range[numROIsCBs], cb]}]; {cb, 1, numROIsCBs}];

In[ ]:= Table[Evaluate@ToExpression[StringJoin["overallFRstaRand", ToString[cb]]] = Mean[
  Table[ToExpression[StringJoin["staRandFRCB", ToString[cb], "CB", ToString[cb2]]],
    {cb2, DeleteCases[Range[numROIsCBs], cb]}]; {cb, 1, numROIsCBs}];

In[ ]:= (*****
  (**Visualize event-triggered average for each cell body**)

In[ ]:= Manipulate[{ListLinePlot[{ToExpression[StringJoin["overallFRsta", ToString[cb]]],
  ToExpression[StringJoin["overallFRstaRand", ToString[cb]]],
  PlotRange -> All}], {cb, 1, numROIsCBs, 1}]

In[ ]:= (*****Export data*****

In[ ]:= CreateDirectory[StringJoin["S:/Imaging/Garrett/FMB208_2PRig/", date, "/", mouse,
  "/Session", ToString[sessionNum], "/", "PMSpikeTriggeredAvgCBActivity_FRestimates/"]];

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In[ ]:= Table[Export[StringJoin["S:/Imaging/Garrett/FMB208_2PRig/", date, "/", mouse, "/Session",
ToString[sessionNum], "/", "PMSpokeTriggeredAvgCBAActivity_FRestimates/",
"overallFRstaCB", ToString[cb], ".txt"],
ToExpression[StringJoin["overallFRsta", ToString[cb]]]], {cb, 1, numROIsCBs}];

In[ ]:= Table[Export[StringJoin["S:/Imaging/Garrett/FMB208_2PRig/", date, "/", mouse, "/Session",
ToString[sessionNum], "/", "PMSpokeTriggeredAvgCBAActivity_FRestimates/",
"overallFRstaRandCB", ToString[cb], ".txt"],
ToExpression[StringJoin["overallFRstaRand", ToString[cb]]]], {cb, 1, numROIsCBs}];

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