Quantitative Analysis of Negation in Two Cree Corpora

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Background
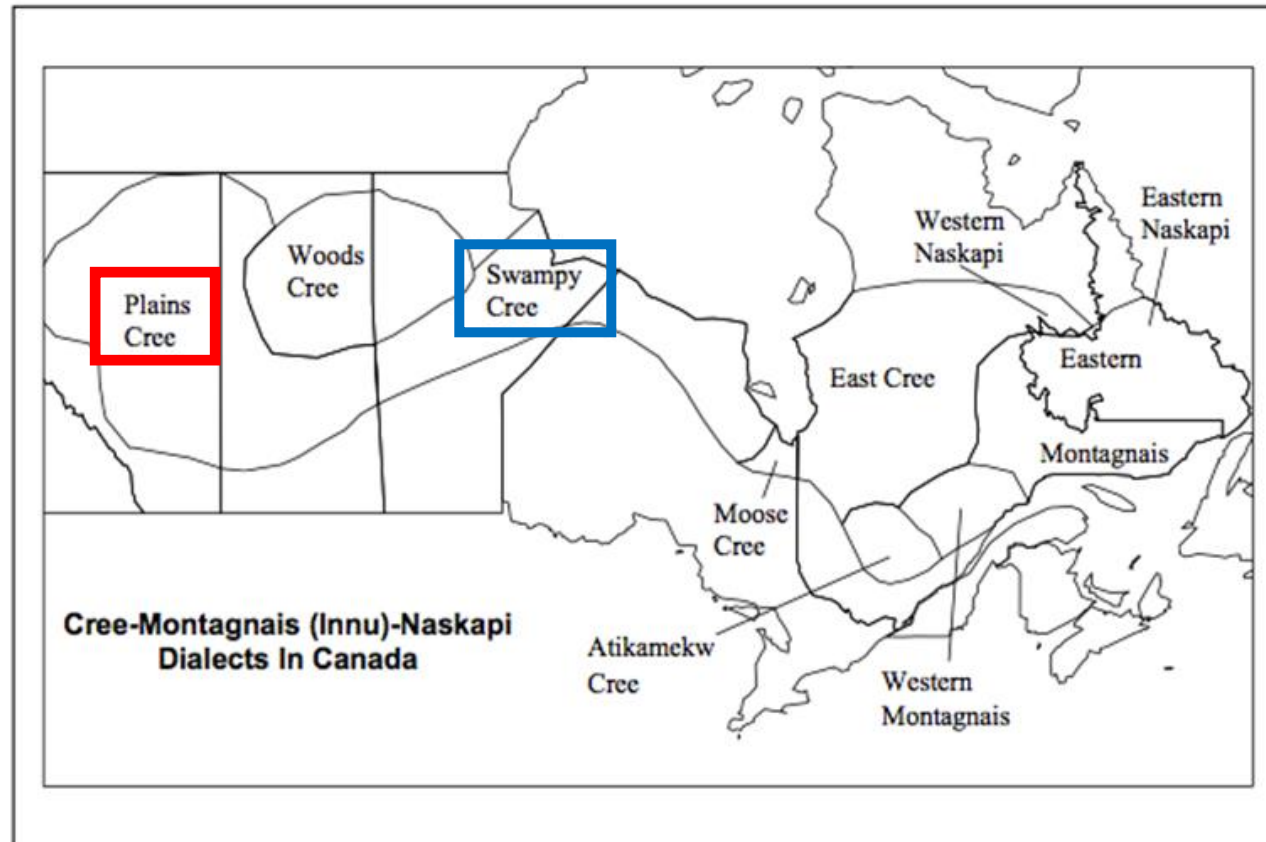
Varieties of Cree

Cree-Montagnais (Innu)-Naskapi Dialects In Canada

Image from Junker et. al, 2012

Structure of negation in Cree

moona　　　_ohci-nisitohtaatowak._
NEG　　　　　COMPL-understand.IND
'They did not understand each other.'　　(Scott et al. 1995, p. 12)

kiiy-ayamihikowak,　**_eekaa_** _maaka_　　　_ee-waapamaacik._
PAST-speak.IND　　　NEG　but　　　COMPL-see.CONJ
'They were spoken to, and still they didn't see him.'

(Scott et al. 1995, p. 8)

Cree Grammar: Inflectional Order

- Plains Cree:
  - nimaaton
    1s.cry.VAI.INDEP
    'I cry'
  - ee-maatoyaan
    COMPL-cry.VAI.CONJ.1s
    'As I am crying'
- Muskeg Cree:
  - nimaaton
    1s.cry.VAI.INDEP
    'I cry'
  - ee-maatoyaan
    SUB-cry.VAI.CONJ.1s
    'As I am crying'

Cree Grammar: Clause type

- ## Plains

  - <u>ee-maayimahcihot</u>   ooma   awa   eekosi   aahkosiwikamikohk niwii-itohtahaaw.
    COMP-feel.bad.VAI.CONJ.3s FOCUS   this   so   hospital.LOC   1s.intent-take.VTA.INDEP.1-3
    'This one is feeling ill so I am taking him/her to the hospital' (main clause)   (Okimaasis 2004, 276)

  - aahkosiwikamikohk   awa   niwii-itohtahaaw   <u>ayisk   ee-maayimahcihot</u>.
    hospital.LOC   this   1s.intend-take.VTA.INDEP.1-3   because   COMP-feel.bad.VAI.CONJ.3s
    'I am taking this one to the hospital because s/he is feeling ill' (subordinate clause) (Okimaasis 2004, 276)

- ## Muskeg

  - kii-miicisow.   kii-takoshinaawaaw. | kii-miicisow   kaa-takoshiniyeek.
    PAST-eat.VAI.INDEP.3s   PAST-arrive.VAI.INDEP.2p   PAST-eat.VAI.INDEP.3s   PAST-arrive.VAI.CONJ.2p
    (main clause + main clause)   (main clause + subordinate clause)
    'S/he was eating. You (pl.) arrived.'   'S/he was eating while you arrived.' (Ellis 2004, p. 8)

Cree Grammar: Reality status

- Plains Cree
  - Marks irrealis verbs with a preverb *ka-,* or the subjunctive ending *-i*

    nikii-kweecimaaw Nettie **ka**-pee-itohteet.

ni-	kii-	kweecim	-aa	-w	Nettie	**ka-**	pee-	itohtee	-t
1-	PREV-	ask.VTA	DIR	-3	Nettie	**IRR-**	come-	go.VAI	-3

    'I asked Nettie to come."   (Cook 2014, c2p16)

- Muskeg Cree
  - Reality status can be expressed using a combination of factors (mood, order, etc.), as well as the irrealis preverb.

    kisaaspin waapamakee,   n'ka-miinaaw
    if   see.s.o.VTA.CONJ.SUBJ.1-3   1sg.FUT-give.to.s.o.VTA.INDEP.IND.NEUT.1-3
    'If I see him, I shall give it to him.' (CONJ SUBJUNCTIVE – real)   (Ellis 2004, p. 416)

    kisaaspin   waapamak,   n'ka-miinaahtay
    if   see.s.o.VTA.CONJ.IND.1-3   1sg.FUT-give.to.s.o.VTA.INDEP.IND.PRET.1-3
    'If I were to see him, I would give it to him.' (CONJ INDICATIVE– unreal)   (Ellis 2004, p. 416)

Hypotheses about what impacts Negation in Plains Cree

- Inflectional order
  - *ekaa* with conjunct and imperative; *nama/namooya* with independent
  - Bloomfield 1926; Wolfart 1973; Okimaasis 2018
- Clause type
  - *ekaa* with subordinate; *nama/namooya* with main
  - Reinholtz & Wolfart 1996
- Clause type & reality status
  - *ekaa* with embedded; *namooya* with matrix
  - Also*: ekaa* with irrealis
  - Cook 2014
- *Clause type & veridicality
  - *ekaa* in subordinate; *nama* in main
  - Also: *ekaa* in non-veridical
  - Déchaine & Wolfart 2017

Hypotheses about what impacts negation in Muskeg Cree

- Inflectional order
  - *ekaa* with conjunct (and imperative); *moona* with independent (and in isolation)
  - Ellis 2000, 2004, 2016

Research questions

- Plains Cree
  - Is the pattern of negation consistent with any of the previously outlined hypotheses?

- Muskeg Cree
  - Is the pattern of negation consistent with the previous hypothesis for the dialect?
  - If not:
    - Is the pattern of negation consistent with any of the hypotheses proposed for Plains Cree?
    - Is the pattern of negation consistent with the pattern observed for Plains Cree?

Methods

The corpora

- Collection methods
  - Negative tokens extracted from bilingual Cree-English texts
    - Natural speech data elicited from Cree native speakers
- Structure of the Plains Cree corpus
  - 1037 negative tokens (622 coded)
  - Year of birth from 1896 – 1972
  - 26 unique speakers represented (~80% of tokens by women)
- Structure of the Muskeg Cree corpus
  - 349 negative tokens (260 coded)
  - Year of birth from 1895 – 1962
  - 5 unique speaker represented (<1% of tokens by women)

Variable rules analysis

- Method from Variationist Sociolinguistics
- Perspective:
  - Variation is a healthy and inherent part of language
    - Not error or lack of knowledge
  - Variation should be investigated and understood
    - Not ignored or 'smoothed away' to make analysis simpler
- Most commonly used:
  - On widely-spoken, well-studied languages (especially English)
  - On big corpora of naturalistic speech

Variable rules analysis

- Logistic regression
  - Attempting to model the relationship between a binary response variable (form of the negator) using one or more predictors (clause type, reality status, order, etc.) and the possible interaction of predictors.
- How to interpret the model:
  - AICc: trade-off between fit and complexity of model (lower AIC = better fit)
  - R^2: proportion of variation explained by model (higher R^2 = more variation explained)
  - Factor weight: measurement of how the factor influences the probability of choosing the application value (values $0 – 0.49$ disfavour, and $0.51 – 1$ favour)

Results

Predictions:

- The best model gives support to the hypothesis

- For instance:
  - If inflectional order is 100% responsible for the form of the negator, a model with inflectional order alone should be best
  - If clause type + reality status is responsible, a model with those predictors (and interaction) should be best

Plains Cree Results

Hypothesis 1: Inflectional order alone

Analysis of negation (application value = *eekaa*): Inflectional order with Speaker as a random effect

Input: 0.0629			N = 622	
Factor	logodds	FW	Proportion	N
Inflectional order *(p < 0.00001)*				
Conjunct	2.164	.90	38.1	265
Independent	-2.164	.10	1.1	357
Range		*80*		
Model: intercept = -2.701, df = 3, AICc = 383.075, R^2 fixed = 0.504				

Hypothesis 2: Clause type alone

Analysis of negation (application value = *eekaa*): Clause type with Speaker as a random effect

Input: 0.138			N = 622	
Factor	logodds	FW	Proportion	N
Clause type *(p < 0.00001)*				
Subordinate	2.261	.91	55.8	163
Main	-2.261	.09	3.1	459
Range		82		
Model: intercept = -1.829, df = 3, AICc = 324.902, R^2 fixed = 0.41				

Hypothesis 3: Clause type & reality status*

Analysis of negation (application value = *eekaa*): Clause type and reality status with Speaker as a random effect

Input: 0.176				N = 622
Factor	logodds	FW	Proportion	N
Clause type *(p < 0.00001)*				
Subordinate	2.188	.90	55.8	163
Main	-2.188	.10	3.1	459
Range		*80*		
Reality status *(p < 0.02)*				
Irrealis	0.475	.62	44.7	76
Realis	-0.475	.38	13.0	546
Range		*24*		
Model: intercept = -1.543, df = 4, AICc = 320.524, R^2 fixed = 0.42				

Reality status alone

Analysis of negation (application value = *eekaa*): Reality status with Speaker as a random effect

Factor	logodds	FW	Proportion	N
Input: 0.241			N = 622	
Reality status *(p < 0.00001)*				
Irrealis	0.905	.71	44.7	76
Realis	-0.905	.29	13.0	546
Range		62		
Model: intercept = -1.146, df = 3, AICc = 518.427, R^2 fixed = 0.08				

Summary

- Inflectional order
  - Highly significant
  - Very strong effect
  - Conjunct favours *eekaa*; Independent disfavours *eekaa*
- Clause type
  - Highly significant
  - Very strong effect
  - Subordinate favours *eekaa*; Main disfavours *eekaa*
- Reality status
  - Highly significant
  - Strong effect
  - Irrealis favours *eekaa*; Realis disfavours *eekaa*

Comparison of the models

	Inflectional Order	Clause Type	Clause Type + Reality Status
AICc	**383.075**	**324.902**	**320.524**
R_2	0.50	0.41	0.42

Best fit

Muskeg Cree Results

Hypothesis 1: Inflectional order alone

Analysis of negation (application value = *eekaa*): Inflectional order

Input: <.001				N = 260
Factor	logodds	FW	Proportion	N
Inflectional order *(p < 0.00001)*				
Conjunct	11.909	>.999	90.5	84
Independent	-11.909	<.001	0.0	176
Range		*99.8*		
Model: intercept = -9.657, df = 2, AICc = 56.881, R^2 = 0.97				

Hypothesis 2: Clause type alone

Analysis of negation (application value = *eekaa*): Clause type

Input: < .001				N = 260
Factor	logodds	FW	Proportion	N
Clause type *(p < 0.00001)*				
Subordinate	11.206	>.999	86.4	88
Main	-11.206	<.001	0.0	172
Range		*99.8*		
Model: intercept = -9.36, df = 2, AICc = 74.149, R^2 = 0.97				

Hypothesis 3: Clause type & reality status*

Analysis of negation (application value = *eekaa*): Clause type & reality status

Factor	logodds	FW	Proportion	N
Input: < .001			N = 260	
Clause type				
Subordinate	12.044	>.999	86.4	88
Main	-12.044	< .001	0.0	172
Range		99.8		
Reality status				
Irrealis	-0.709	0.33	45.7	70
Realis	0.709	0.67	23.2	190
Range		34		
Model: intercept = -10.067, df = 3, AICc = 71.563, R^2 = 0.98				

Reality status alone

Analysis of negation (application value = *eekaa*): Reality status

Input: 0.335				N = 260
Factor	logodds	FW	Proportion	N
Reality status (*p < 0.00001*)				
Irrealis	0.514	0.63	45.7	70
Realis	-0.514	0.37	23.2	190
Range		26		
Model: intercept = -0.686, df = 2, AICc = 306.22, R^2 = 0.06				

Summary

- Inflectional Order
  - Highly significant
  - Very strong effect (almost categorical)
  - Conjunct favours *eekaa*; Independent disfavours *eekaa*
- Clause Type
  - Highly significant
  - Very strong effect (almost categorical)
  - Subordinate favours *eekaa*; Main disfavours *eekaa*
- Reality Status
  - Highly significant
  - Weak effect
  - Interacts with Clause Type
  - Irrealis favours *eekaa*; Realis disfavours *eekaa*

Comparison of the models

	Inflectional Order	Clause Type	Clause Type & Reality Status
AICc	**56.881**	**74.149**	***71.563**
R_2	0.97	0.97	*0.98

Best fit

Concerns about the Muskeg results

- Statistical
  - (Near)-categorical factors
  - Collinearity of some factors
  - Unmodelled interactions
  - Size of dataset
  - Inability to run Speaker as a random effect
- More generally
  - Representativeness of the current dataset

Conclusions

Plains Cree

- Which (if any) hypothesis does the Plains Cree data support?
  - Hypothesis 1: Inflectional order alone
  - Hypothesis 2: Clause type alone
  - Hypothesis 3: Clause type & reality status combined
- Of these:
  - The model of Hypothesis 3 performs best

Muskeg Cree

- Which hypothesis does the Muskeg Cree data support?
  - Hypothesis 1: Inflectional order alone
    - (proposed for this dialect)
  - Hypothesis 2: Clause type alone
  - Hypothesis 3: Clause type & reality status combined
- Of these:
  - The model of Hypothesis 1 performs best
- The Muskeg Cree data is <u>not</u> patterning with the Plains Cree data

Summary

- What does this tell us about negation in these two dialects more generally?

- Plains Cree:
  - Both Clause type and Reality status appear to be playing a role
  - Moderate r2 value suggests more may be needed to fully explain the pattern

- Muskeg Cree
  - Inflectional order alone is explaining the current dataset very well
  - Reality status does seem to be a significant factor as well
  - Concerns about generalizability

On the use of variable rules analysis

- Variable rules analysis can provide quantitative support for hypotheses about negation in Cree
  - The value of using everything in the toolbox
- Potentially very useful when there are competing hypotheses ascribing variation to two very similar factors
  - i.e. Muskeg Inflectional order vs. Clause type
- Focus on widely-spoken languages (esp. Indo-European)
  - Partly due to limitations of the method (e.g. sample size)
- **How does the data a method is designed for shape development?**
- **How generalizable are results if aren't replicated across language families?**

Future possibilities

- Plains Cree
  - Running models that allow multiple levels for the response variable
    - Testing relationship between other negative particles
  - Permitting the data to have random slopes based on Speaker
    - Testing Guy 1980, rather than assuming
- Muskeg
  - Incorporating more naturalistic data
    - Other sources, or inclusion of more tokens from the set
  - Possibly incorporating elicitation materials
    - Problem of assumptions
  - Looking at other factors and other response variables

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Thank you!